FLIGHT

The AIRCRAFT ENGINEER AND AIRSHIPS

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Founder and Editor: STANLEY SPOONER

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DIARY OF CURRENT AND FORTHCOMING EVENTS

Club Secretaries and others desirous of announcing the dates of important fixtures are invited to send particulars for inclusion in this list:—

1931
June 19. Flying Display, Andover.
June 20. Flying Display, Bristol Airport S.B.A.C. Cup Race.
June 20. Opening of Flying School at Barton (Manchester).
June 21. N.F.S. Air Pageant, Reading.
June 22. Entries Close for King's Cup Race.
June 23. National Physical Laboratory Inspection, Teddington.
June 25. Opening by Duke of York, of Air Service Training, Ltd. Flying School, at Hamble.
June 26. R.A.F. Dinner Club Annual Dinner, Connaught Rooms.
June 27. Royal Air Force Display, Hendon.
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July 4-5. Norfolk and Norwich Ae.C. At Home, Mousehold Aerodrome.
July 4-6-7. Cricket. R.A.F. *v.* Army at the Oval.
July 10-19. Circuit of Italy.
July 15-16. Cricket. R.A.F. *v.* Civil Service at Uxbridge.
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July 22. Household Brigade Flying Club Meeting, Heston.
July 25. King's Cup Race.
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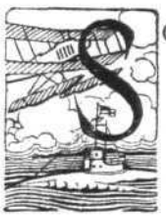
Aug. 3-4. Cricket. R.A.F. *v.* R.N. at Halton.
Aug. 15. Scarborough Ae.C. Air Pageant.
Aug. 15. Manchester-Liverpool Inter-City Race.
Aug. 22. Newcastle-on-Tyne Meeting.
Sept. 5. Norfolk and Norwich Ae.C. Display at Yarmouth.
Sept. 5. Haldon Flying Meeting.
Sept. 12. Schneider Trophy Contest.
Sept. 26. Garden Party, Bristol and Wessex Ae.C.
1932.
May 31. Closing date for Cellon Cross-Channel Glide £1,000 Prize.

EDITORIAL COMMENT



"SO long as aircraft are the main force at the disposal of the commander, a small but extremely mobile ground force is desirable to assist him by close co-operation; it is also essential that this force should be commanded by an officer with a thorough understanding of the capabilities of the air arm." This sentence occurred in a lecture delivered some time ago before the Royal United Service Institution by Squadron Leader Godsave, the subject of which was "Armoured Cars in Desert Warfare." He explained that a ground force, which best took the form of armoured cars, was a desirable factor in what is known as Air Control. He considered it essential that the ground force should be commanded by someone who understood the air arm. The rest of the paper concerned the tactical employment of the armoured car sections of the Royal Air Force in Iraq and Transjordan. It was a very valuable paper, because little is generally known of those units, and yet they are a very unique and significant feature of the Royal Air Force. That those units are extremely efficient was testified to by Air-Marshal Sir Robert Brooke-Popham, who said that when he had given orders to a car section, perhaps by wireless late one evening, that it was to be at some place 150 miles away by 3 p.m. next day, he never worried any more about it, as he was always sure that the cars would be at the given spot at the given time.

R.A.F. Armoured Cars

The real significance of these armoured car units is that they are examples of a principle which is sometimes overlooked by over-zealous upholders of aircraft. One sometimes hears the theory laid down that the responsibility of the three services does or should begin and end with the element with which each service is chiefly concerned. Everything which goes into the air should be a responsibility of the Air Ministry, everything which fights on land must be under the command of the War Office, and so on. It is a principle which will not stand the test of actual practice. The Royal Air Force is given control of certain territories. At once it proceeds to raise

its own ground forces. It does not go to the War Office and ask for armoured cars. If it did, it would have to spend (or rather to waste) considerable time in training the *personnel* of the car sections to work with aircraft. Car sections raised by the R.A.F. and manned by R.A.F. officers and airmen start with a knowledge of the capabilities and limitations of the air arm, and that knowledge was rightly said by Squadron Leader Godsave to be " essential." There is nothing illogical about the proceedings. The cars form part of air defence or air control, as the case may be, and so they are rightly raised and controlled in every respect by the Royal Air Force. That force, it has been shown more than once, cannot achieve its objects by aircraft alone. Co-operation by ground troops is almost always necessary. We commented once before on the same point in connection with the Air Force campaign in Aden to eject a recalcitrant Sheikh from the districts for which we are responsible. In that case the ground troops took the form of a rising of tribes friendly to our cause. This Arab levy was not a very well organised force, but it provided just the ground co-operation which was needed to turn the enemy out of forts which the bombs from the air were not able to destroy.

If in the air control of Iraq, Transjordan, and Aden some ground troops (preferably cars, but also Arab levies) are a necessary part, so we find that at Home certain ground units are an equally essential part of air defence. Aircraft unassisted could do little to ensure the safety of London from hostile air attacks. Coast watchers, sound locators, searchlights, and anti-aircraft guns must all co-operate if the " Furies " and " Bulldogs " are to have a fair chance of shooting the raiders down. Pilots who fly at night admit that they depend almost entirely upon the searchlights to give them some idea of where to look for the hostile night-bombers. The A.A. guns may not shoot many of the raiders down, but they too play a very important part in the defence scheme, and certainly help to break the *moral* of the bomber pilots.

Yet, strange to relate, in Great Britain the searchlights and the A.A. guns are not the property of the Air Ministry. The ground units are raised and provided in all ways by the War Office. Their *personnel* wear khaki, not Air Force blue. It makes no difference at all whether these units come from the regular Army or from the Territorials ; the point is that they are military and not Air Force in composition, though they exist merely to play a very important part in air defence. It is an anomaly which does not exist in Iraq, and it is an anomaly which ought to be abolished in Great Britain.

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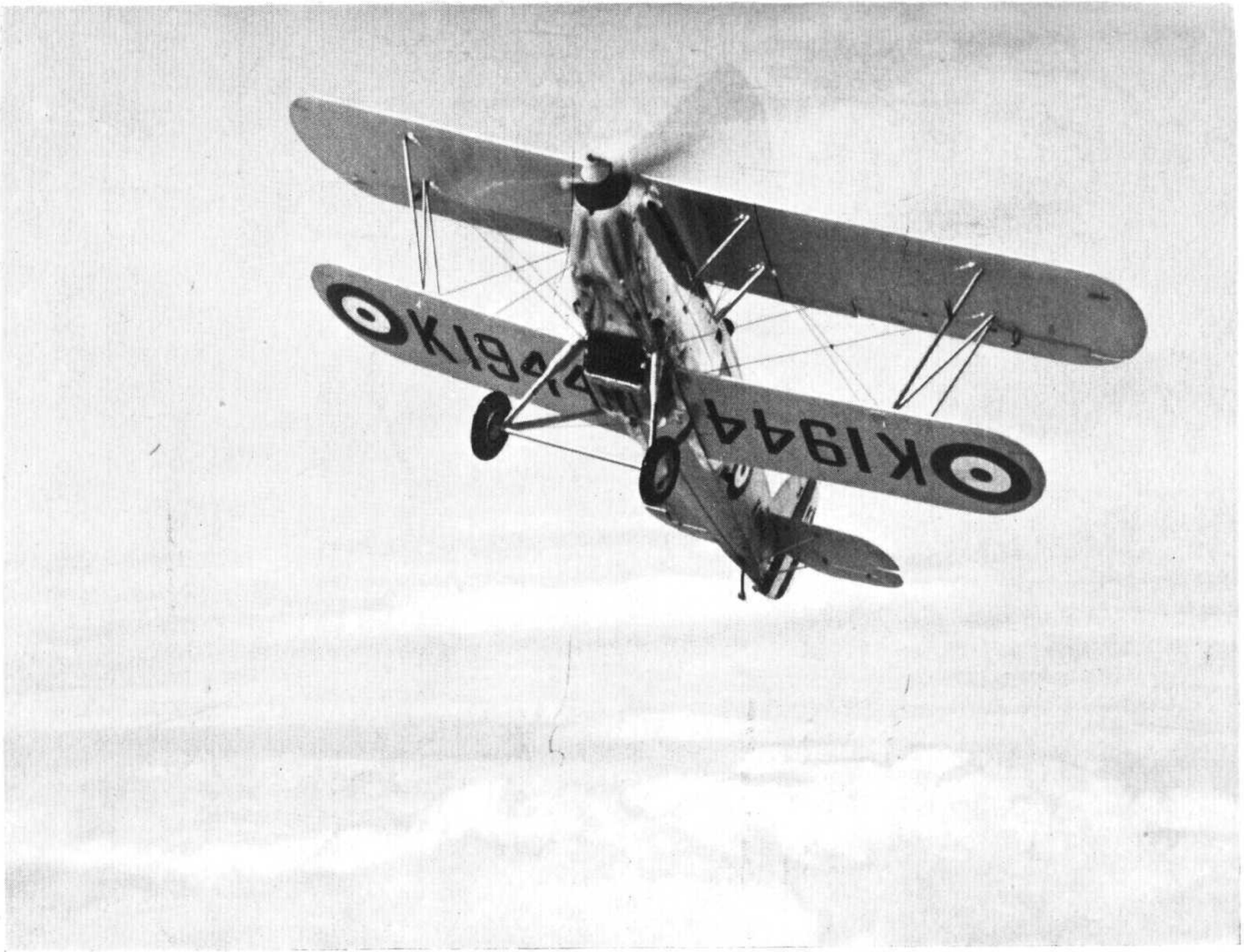
It would be difficult to imagine a better way of furnishing convincing proof of the fact that the compression-ignition aero engine has " arrived " than the endurance flight carried out by the two American pilots Walter Lees and Frederic Brossy, of the Packard Motor Car Company, on a Bellanca " Pacemaker " fitted with the Packard compression-ignition engine. Details of the flight are given elsewhere in this issue of FLIGHT, from which it will be seen that the machine remained in the air (without refuelling, of course) for 84 hr. 33 min. And even then, it was darkness only which made it advisable to land, as the tanks contained enough fuel for another $8\frac{1}{2}$ hours, which would have increased the duration to 93 hours.

C.I. Engine makes a Good Beginning

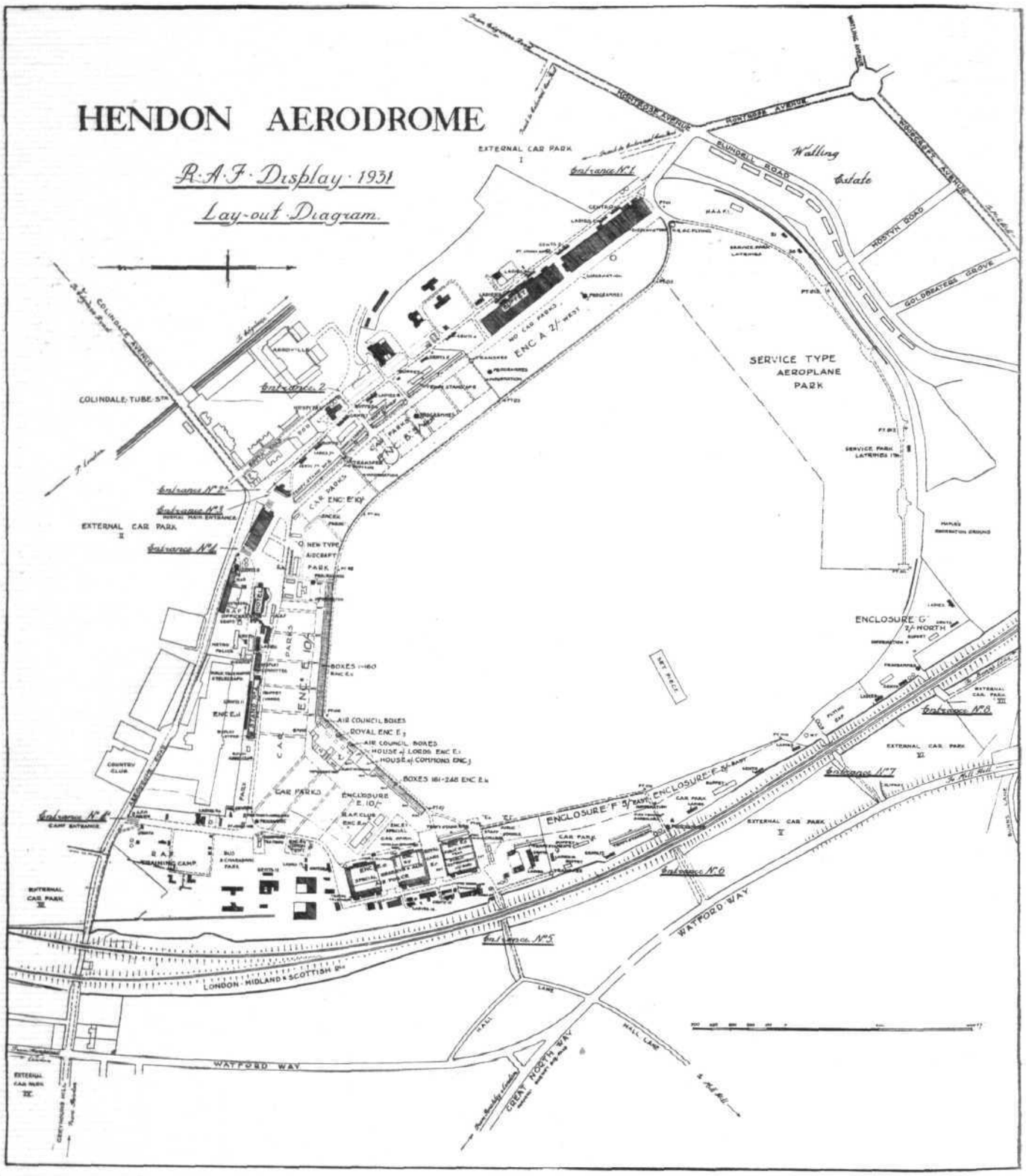
One or two interesting facts emerge from this very successful trial of the Packard engine. One is that during the early part of the flight the engine was run at a speed corresponding to 122 b.h.p. When it is borne in mind that at the start of the flight the wing loading was 18.1 lb./sq. ft., and the power loading 29.9 lb./h.p., it speaks well for the efficiency of the machine that it only required 122 h.p. to keep it in the air. In this respect an endurance flight is, of course, very different from a distance flight. In the former the cruising speed can be kept down to whatever corresponds to the minimum fuel consumption. In a distance flight, on the other hand, a higher speed has to be chosen in order to cover the greatest distance per unit of fuel.

The fact that towards the end of the flight the power required to remain aloft was only 34 b.h.p. also shows the aerodynamic cleanness of the Bellanca. And the advantages of the Diesel type of engine were, of course, very strongly brought out when it came to cruising at very low power. In fact, the compression-ignition engine would show at its very best under these conditions. When the petrol engine is throttled down to one-seventh of its normal power, as the Packard was towards the end of the flight, its specific fuel consumption becomes very poor. The C.I. engine maintains its low fuel consumption even when well throttled, and the makers estimate that a petrol engine of the same power would only have been able to keep the machine in the air for 82 hours compared with the possible 93 hours of the Packard. For the commercial aeroplane of the future this inherent feature of the compression-ignition engine is valuable in giving fuel economy at cruising speed, apart from any advantage of immunity from fire which the use of heavy oil may give. The two pilots and the Packard Company are to be congratulated on a fine performance, and one should link with these names that of the late Mr. Woolson, the designer of the engine, who lost his life last year in a flying accident.



INTERCEPTING EXTRAORDINARY: Our *Photographer has caught* the Hawker "Fury" (Rolls-Royce "Kestrel" engine) high above the clouds as Mr. Bulman swung it up and out in an Immelman Turn after "attacking" a Hawker "Horseley" piloted by Mr. Sayer.

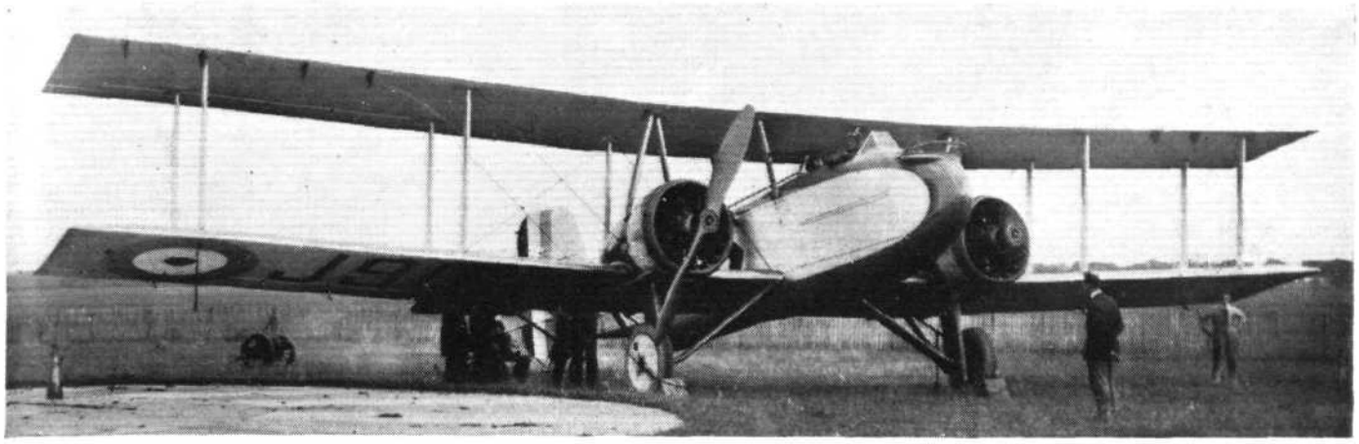
(FLIGHT *Photo.*)



THE R.A.F. DISPLAY

THE Royal Air Force Display at Hendon, on Saturday, June 27, in aid of Royal Air Force charitable and philanthropic objects, as in previous years, promises to attract very large crowds, and we would remind readers that to ensure a comfortable journey, it is advisable to start early. The gates open at 10 a.m. Early arrival ensures a good viewpoint and for motorists a good berth in the Internal Car Parks. The main programme commences at 3 p.m., but there will be continuous flying from noon until 6 p.m. The prices of admission are as follow:—Boxes (to hold six persons, including children), £7, £5, £4 (limited in number). Enclosures: 10s., 5s. and 2s. per person. (Children under 12 years of age, half-price.) No advanced booking to the 2s. enclosures. Reserved seats on Stands can only be obtained from Keith Prowse & Co., Ltd., 159, New Bond Street, and 48, Cheapside, E.C.2, and all Branches, and from all theatre ticket agents. In 10s. enclosure, 3s. and 2s. 6d. In 5s. enclosure, 2s. 6d. No half-price tickets are issued for either of these enclosures. Internal Car Park arrangements: Chars-a-banc and buses in 10s. enclosure, £2; motor cars, 10s.; motor cycles, 2s. In 5s. enclosure: Chars-a-banc and buses, £1; motor cars, 5s.; motor cycles, 2s. External car parks controlled by the R.A.C. are provided near the entrances.

Tickets and badges for the admission of spectators to boxes, the 10s. and 5s. enclosures and car labels for admission to the car parks in these enclosures, can be purchased from The Display Secretary, R.A.F. Station, Hendon, N.W.9 ('Phone Hendon 2823), from any R.A.F. Station, the Secretary, R.A.F. Memorial Fund, 7, Iddesleigh House, Caxton Street, Westminster, S.W.1, and all theatre ticket agencies.



THE LATEST "SIDESTRAND"

Supercharged Bristol "Jupiter" X.F. Engines have now been fitted, with the result that, although the take-off and landing characteristics are not affected, the Speed at Altitude and Rate of Climb are greatly improved

APART from the fitting of supercharged engines, and the provision of Boulton & Paul combined Townend Rings and exhaust collectors, the "Sidestrand" shown in the accompanying photograph is identical with previous "Sidestrand" day-bombers produced by Boulton & Paul, Ltd., of Norwich. It will be recollected that the "Sidestrand" was first equipped with two Bristol "Jupiter VI" engines, and afterwards with two "Jupiter VIII F" engines. With these power plants the machine has always been noted for its excellent all-round performance and great manœuvrability. The fitting of the supercharged "Jupiters," combined with Townend drag-reducing rings incorporating the exhaust collectors, has naturally increased the performance at altitude, while at the same time maintaining the take-off and landing characteristics of the earlier types.

The "Jupiter X.F" develops a maximum output of 560 b.h.p. at 11,000 ft., and the result of fitting two of these engines has been that the rate of climb increases gradually to that height, at which it has become no less than 1,400 ft./min. Similarly, the maximum speed increases from 150 m.p.h. near the ground to nearly 170 m.p.h. at 13,000 ft., and the speed remains above 160 m.p.h. up to 18,000 ft. This height, by the way, is reached in the remarkably short time of 15 minutes, with full load, of course.

Good as these figures are, Boulton & Paul claim that they could be materially exceeded. It must be remembered that the "Sidestrand" was designed several years ago, for use with normally-aspirated engines, and it is claimed that by designing in the light of more modern knowledge, especially for the modern supercharged engines now available, a better ratio of gross weight to tare weight, as well as a better performance, could be achieved. For example, it is estimated to be within the range of practicability to design a supercharged twin-engined bomber with the offensive and defensive qualities of the "Sidestrand," a range of some 1,000 miles, and a top speed of more than 200 m.p.h. at operating height. These are bold claims, certainly, but we feel certain that a firm of the standing of Boulton & Paul would not make them without having studied the subject sufficiently to be justified in their claims.

The discussion of the relative advantages of twin-engined and single-seater aircraft has by no means ceased, nor has, so far, any very decisive conclusions been reached. Both schools still have their strong advocates, and very convincing arguments are advanced by both sides.

The twin-engined school points to experience with the standard "Sidestrand" (which is the only twin-engined day-bomber in use in this country), having shown that the machine is practically immune from successful attack by existing types of single-seater fighters, due partly to the good performance and manœuvrability, and partly to the fact that it provides a steady gun platform, undisturbed by nose engine slipstream and vibration, and with an all-round view and field of fire. The "Sidestrand" with supercharged engines, it is claimed, would be able, owing to its nearly 30 m.p.h. greater speed at operating height and increased manœuvrability due to greater power reserve, to avoid engagement by enemy machines under all normal circumstances, while it would have greater tactical advantages than the older type if it did accept combat.

Another advantage claimed for the twin-engined machine as compared with the single-engined is that it is able to return to its base after one engine has been put out of action, thus greatly reducing the wastage of machines, and, probably, improving the *moral* of the crew. In this connection it should be pointed out that both the standard and the supercharged "Sidestrands" are able to climb with full load with one engine stopped.

It has been the custom to regard the twin-engined biplane as necessarily inferior in aerodynamic efficiency to the single-engined type. When we described the "Sidestrand" in detail (FLIGHT, March 29, 1928), we pointed out that Mr. J. D. North and his technical staff appeared to have got the drag down to a figure comparable with that of a single-engined machine. In the latest type, modifications have been introduced, and Townend rings fitted, which further reduce the drag, and there is now no doubt that the latest "Sidestrand" is one of the most efficient twin-engined aircraft ever produced.

Main Data of Supercharged "Sidestrand"

Length, overall, 41 ft. 0 in. (12.5 m.).
Wing span, 72 ft. 0 in (21.95 m.).
Wing chord, 7 ft. 0 in. (2.13 m.).
Wing area, 1,000 sq. ft. (93 sq. m.).
Power plant, 2 Bristol "Jupiter X.F" at 560 h.p.
Fuel capacity, 260 gallons (1,180 litres).
Weight, empty (including all fixed equipment), 6,877 lb. (3,125 kg.).
Weight, fully loaded, 10,200 lb. (4,640 kg.).
Ratio, gross weight/tare weight, 1.485.

The following performance figures refer to full gross weight of 10,200 lb.

Maximum speed at 11,000 ft. (3,350 m.), 167 m.p.h. (269 km./h.).
Maximum speed at 18,000 ft. (5,500 m.), 161 m.p.h. (259 km./h.).
Rate of climb at 11,000 ft., 1,400 ft./min. (7.1 m./sec.).
Time to 11,000 ft. (3,350 m.), 8½ min.
Time to 18,000 ft. (5,500 m.), 15 min.
Service ceiling, 30,000 ft. (9,150 m.).
Landing speed, 54 m.p.h. (87 km./h.).

MONOSPAR WING FOR FOKKER F.VII-3M

The wing being built for flying tests on a three-engined Fokker monoplane is now nearing completion, and it is hoped to test the machine in flight in a few weeks' time. The estimated wing weight of ten per cent. of the gross weight of the machine appears to have been realised. In other words, the monospar wing for the Fokker weighs 1·27 lb./sq. ft., which must be regarded as good for a cantilever wing

POSSIBLY many of our readers will remember that at the International Aero Show at Olympia in the summer of 1929 was exhibited for the first time a most unusual aircraft wing test section, in which bending stresses were taken by a single spar, torsional stiffness being provided by the somewhat unusual "spiral" tierod bracing. This type of wing construction is the invention of a Swiss engineer, Mr. Stieger, who formed, with others, the Mono-Spar Co., Ltd., with offices in Byron House, 7-9, St. James's Street, London, S.W.1.

After the Olympia Aero Show, the Mono-Spar Company set to work to design a small twin-engined aeroplane in which the monospar type of wing construction could be tested out thoroughly in actual flight. This machine, which was built for the Mono-Spar Company by the Gloster Aircraft Co., Ltd., of Brockworth, Glos., was completed some months ago, and has been doing a lot of experimental flying. As an aircraft, this machine, which was illustrated on p. 518 of FLIGHT for June 12, has not yet gone into production, although it is hoped that it will do so, but from the experience with it during many hours of test flying, sufficient has been ascertained to show that the monospar wing construction does all its designer expected of it.

At the time of the Olympia show, Mr. Stieger claimed that his system of wing construction would increase the pay load of a fairly large machine by about 33 per cent. Evidently Mr. Stieger's arguments convinced the Air Ministry authorities, for an order was placed with the Mono-Spar Company for a large cantilever monospar wing for the Fokker F.VII-3M., owned by the Air Ministry. This machine, as our readers will know, is a large three-engined monoplane, with a gross weight of about 8,000 lb., and therefore forms a useful size for experimentation with single-spar wing construction. The work of building the wing was entrusted to the Gloster Aircraft Co., Ltd., whose works at Brockworth are admirably suited to experimental work of this nature.

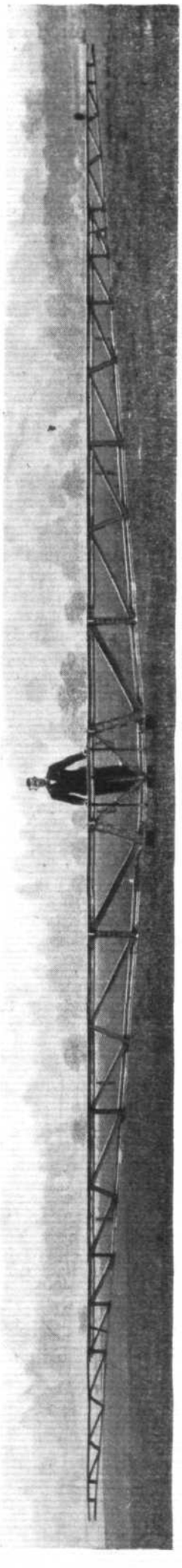
The single spar for this wing has now been completed, and is shown in the accompanying photographs. The torsional bracing is now being rigged, and the wing should be covered and ready to be put on the machine within a few weeks.

For a wing span of 64 ft. and a wing area of 630 ft., the monospar wing of the Fokker weighs 10 per cent. of the gross weight of the machine, or 800 lb., which corresponds to a specific wing weight of 1.27 lb./sq. ft.

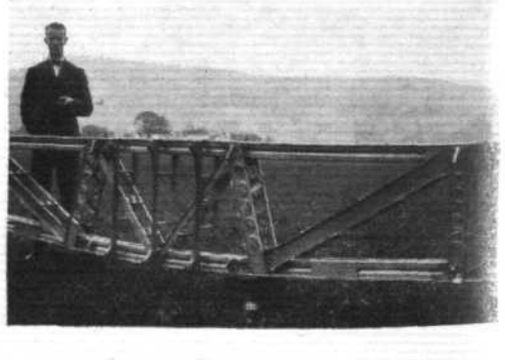
We are informed by the Mono-Spar Company that weighing of the spar and the components for the torsional bracing, etc., indicates that not only will Mr. Stieger's original claim be fulfilled, but actually exceeded. The wing weight works out at such a figure that the pay load of the Fokker can be increased by more than 35 per cent. This increase in pay load, which is, of course, achieved without affecting the machine's performance and aerodynamic features, is almost sufficient in itself to take a machine from the subsidy-requiring into the "fly-by-itself" class, and thus it would appear that Mr. Stieger's ingenuity may have a considerable influence on the future of commercial aviation. For certain classes of commercial aircraft, as well as for military aircraft, such as bombers, the reduction in structure weight may, of course, be used not in increasing the useful load, but in extending the range of the aircraft. From either point of view, any system of construction which will reduce structural weight materially is to be welcomed. The Stieger system seems to be one such. Other designers seek the same results by a multiplicity of spars. Others again, by using stress-bearing covering. A superficial examination of the question would appear to indicate that, other things being equal, the single-spar type of construction is likely to be simpler, and therefore cheaper, than a system in which there are a greater number of components. However, that is a problem which time alone can settle. Meanwhile, it is satisfactory to be able to record that the first large monospar wing is nearing completion, and is promising to work out at the designer's calculated weight figures, or even a little lighter.

This does not, of course, exhaust the problem. Flight tests have yet to be made to ascertain how the wing behaves in a three-engined machine. Whether it suffers in any unsuspected way from vibration or flutter. How it supports the weights of tanks and wing engines. Whether the wing engines have a period of vibration likely to coincide with a period in the wing structure, and so forth. But the experiments with the little twin-engined machine illustrated last week have been encouraging, to say the least.

We are not going to claim that there have been no troubles with the small machine. There *have* been minor troubles. But these have had nothing to do with the monospar wing system as such. Rather with the rest of the machine. They have now been overcome, and the machine has gone to Martlesham for tests. During extensive flight tests by such pilots as Flight-Lieut. Schofield and Squadron-Leader Haig, including high-speed dives, no trace of any tendency to wing flutter has been observed.



A MONOSPAR: On the left, a view of the complete spar, and below, the middle portion of the spar, with Mr. Martin, of the Monospar Company, standing by to give "scale effect."



A HEAVY OIL ENGINE SUCCESS

A Bellanca monoplane equipped with a 225-h.p. Packard-Diesel engine has established the world's non-refuelling endurance record in America, with a continuous flight of 84 hrs. 33 mins. Below we give some particulars of this record, which is a significant achievement for the Diesel-type aero engine.

Walter Lees (right) and Frederic Brossy (left) checking up on their fuel supply before taking off on the record-breaking non-refuelling endurance flight in the Bellanca "Pacemaker" Monoplane with 225 h.p. Packard-Diesel engine.

ON May 26 last Pilots Walter Lees and Frederic Brossy, both connected with the Packard Motor Car Company, took off at Jacksonville, Florida, in a special Bellanca "Pacemaker," powered with a Packard-Diesel engine of 225 horsepower, with a gross weight of 6,715 pounds. This performance, lifting without difficulty the greatest load ever carried in flight by an engine of this power, incidentally demonstrated the altogether unusual efficiency of the Bellanca design, especially when it is borne in mind that in addition to this load-carrying ability, this particular Diesel-powered Bellanca had demonstrated a full speed of no less than 134 m.p.h. After being 84 hours and 33 minutes in the air, they landed in the early evening of May 28, surpassing the previous world's record, made by the famous French pilots, Bossoutrot and Rossi, at Oran, Algeria, by 9 hours and 10 minutes. Rather than attempt a hazardous landing at night the pilots landed the Bellanca-Diesel with sufficient fuel in the tanks to have continued at least 8½ hours longer, or a total endurance of more than 93 hours.

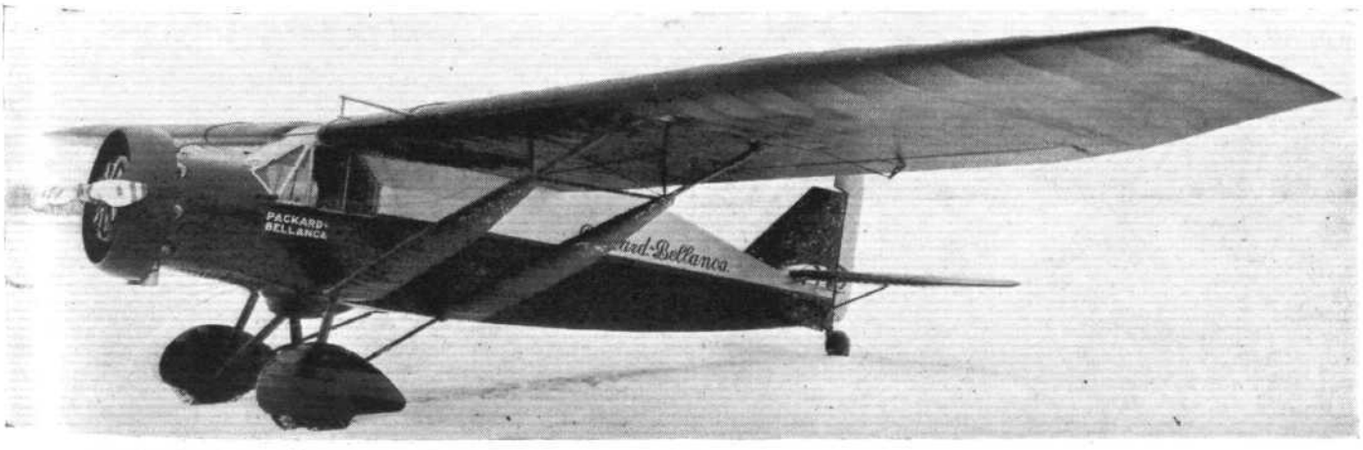
The gross weight of the machine consisted of a weight empty of 2,350 pounds, total fuel and oil of 531 gallons, two pilots, food, water, etc. The actual useful load carried was 4,365 pounds, making a useful load of 19.4 pounds per horsepower. The gross weight of 6,715 pounds represents a loading of 29.9 pounds per horsepower. With this extreme loading the airplane took the air in 31 seconds.

The Packard-Diesel Bellanca used is similar to the standard Bellanca "Pacemaker," a six-place monoplane, from which the seats and passenger furnishings have been removed to provide space for fuel storage. The wing area of the special Packard-Diesel Bellanca is 371 square feet, which is substantially supplemented by the type of external bracing used, the well-known Bellanca lift-struts which are so designed as to form effective lifting surfaces at higher angles of incidence. The fuel on this flight was carried in two wing tanks, 5-gallon cans placed in the cabin and a belly tank which hung below the fuselage. Fuel was first used from the belly tank, which, when empty, was dropped. The 5-gallon cans in the cabin were next used, and as they were emptied they also were dropped overboard, leaving, finally, the full fuel tanks in the wings. With this arrangement and procedure the pilots not only continually lightened the weight empty of their machine, but also provided more room in the cabin.

Computing the difference between the Packard-Diesel consumption and a petrol engine of the same power, the aeroplane would have remained in the air a total of 82 hours compared to the Diesel endurance of 93 hours.

The actual horsepower used during the early part of the flight was 122 h.p. and the r.p.m. 1,565. Fuel consumption the first two hours averaged 11½ gallons per hour. After 82 hours the actual horsepower used was 34 at 1,018 r.p.m., and the fuel, 3.35 gallons per hour.

The non-fuelling endurance record is a competition of nations and is rightly regarded internationally as the most important of the officially recognised records. The great load carried at the start of the attempt is not only the most severe test which can be imposed upon the aeroplane and engine, but is a definite indication of the progress achieved in the design of aircraft in commercial payload carrying ability, range of action and fuel economy in operation. The Bellanca "Columbia" with Wright "Whirlwind" captured the record in 1927 by staying in the air 51 hours and 11 minutes, and the American record has since been held by Brock and Schlee, who remained in the air over 59 hours in the Bellanca "Rosemarie."



Bellanca "Pacemaker" Monoplane with 225 h.p. Packard-Diesel engine, in which the new World's Non-Refuelling Endurance Record was made by remaining aloft 84 hours 33 minutes, at Jacksonville, Florida, May 25 to 28, 1931.

THE ROYAL AERO CLUB OF THE UNITED KINGDOM

OFFICIAL NOTICES TO MEMBERS

A MEETING of The Committee of the Royal Aero Club was held at 3, Clifford Street, London, W.1, on Wednesday, June 10, 1931, at 5 p.m.

Election of Members.—The following new Members were elected:—

Harry Albert Brown, Flight-Lieut. Harold Francis Jenkins, James Morison Shaw Lambie, George Herbert Mysl Miles, Lieut.-Col. Jose Reinhardt, John Herbert Winstanley Shirley, Whitney Willard Straight, Dr. Trevor Gwyn Thomas, Cecil Charles Williams, Charles William Anderson Scott, Major Oliver George Graham Villiers.

Aviators' Certificates.—The following Aviators' Certificates were granted:—

9817	Victor N. Buchan ..	Southern Ae. C.
9818	Jeanie E. Harvey ..	London Ae. C.
9819	Harold P. Hudson ..	Norfolk & Norwich Ae. C.
9820	Peter Godfrey	Norfolk & Norwich Ae. C.
9821	Roderick G. Morrison ..	Reading Ae. C.
9822	Cyril W. Byas	—
9823	John G. Friars	Newcastle Ae. C.
9824	George C. Bateman ..	Hanworth Club (N.F.S.).
9825	Cecil H. Holyoake ..	Leicestershire Ae. C.
9826	John M. Greaves ..	Northern Air Lines.
9827	Francis O. Thornton ..	De Havilland Fl. S.
9828	Audrey J. Hayward ..	Blackpool & Fylde Ae. C. (N.F.S.)
9829	Lord Grimthorpe ..	Yorkshire Ae. C. (N.F.S.)
9830	Pingle M. Reddy ..	Yorkshire Ae. C. (N.F.S.)
9831	Herbert V. Earl ..	London Ae. C.
9832	Jeffrey H. Supple ..	R.A.E. Ae. C.
9833	Herbert C. Higginbotham	Scottish Fl. C.
9834	Elise Battye	Hanworth Club (N.F.S.)
9835	Alexander A. Thomson..	Hanworth Club (N.F.S.)
9836	James E. Lund ..	Hanworth Club (N.F.S.)
9837	Nancy B. Birkett ..	Southern Ae. C.
9838	Hedley W. Bott ..	Leicestershire Ae. C.
9839	Henry B. Tobutt ..	Hampshire Ae. C.
9840	John G. Ormston ..	Herts & Essex Ae. C.
9841	John A. Macdonald ..	Herts & Essex Ae. C.
9842	Frank E. Darlow ..	Herts & Essex Ae. C.
9843	Alastair W. Young ..	Reading Ae. C.
9844	Henry E. L. Meystre ..	Liverpool & Dist. Ae. C.
9845	Robert L. Bowes ..	Hanworth Club (N.F.S.)
9846	Carl W. Ramstedt ..	Bristol & Wessex Ae. C.
9847	Josef Attiah	Reading Ae. C.
9848	Thomas J. Clarke ..	Reading Ae. C.
9849	Samuel H. R. Higgs ..	Reading Ae. C.
9850	Dorothy M. James ..	London Ae. C.
9851	Edward O. Bickford ..	Hampshire Ae. C.
9852	George F. Breese ..	Scottish Fl. C.
9853	Gerald A. Stedall ..	London Ae. C.
9854	J. W. St. John Whitehead	Airwork Fl. School.
9855	Walter Kay	Liverpool & Dist. Ae. C.
9856	John R. Micklethwait ..	Yorkshire Ae. C. (N.F.S.)
9857	Chih-Mei Lo	Brooklands Fl. School.
9858	Humphrey C. Willis ..	Brooklands Fl. School.
9859	Ronald C. Johnson ..	Leicestershire Ae. C.
9860	Charles M. Needham ..	Lancashire Ae. C.
9861	Robert W. Roe ..	Hanworth Club (N.F.S.)
9862	Sir J. L. Dashwood, Bart.	Airwork Fl. School.
9863	Gerald G. Slade ..	Cinque Ports Fl. C.
9864	Wilfred J. MacDougald	Cinque Ports Fl. C.

Gliding Certificates.—The following Gliding Certificates were granted:—

156	Denis C. Francis (A) ..	Channel Gl. C.
157	Geoffrey H. Ambler (A)	Yorkshire Ae. C.
158	Malcolm Sinclair (A) ..	Kilmarnock Gl. C.
43	Stanislaus E. Wells (B)..	Dorset Gl. C.
44	Henry J. Secker (B) ..	Dorset Gl. C.
98	Hubert G. Lympany (B)	Portsmouth & Southsea Gl. C.

Sub-Committees.—The reports of the Touring, New Premises and Racing Committees were adopted.

King's Cup Air Race.—The Royal Aero Club announces that, in addition to the Cup presented by His Majesty The King, the following prizes will be presented by Lord Wakefield of Hythe:—1st Prize, £250; 2nd Prize, £100; 3rd Prize, £50. A special prize of £100 will be awarded for the fastest time round the course.

The Race will take place on Saturday, July 25, 1931, and entries close at 5 p.m. on June 22, 1931. Late entries at double fees at noon on July 1, 1931.

New Club Premises.—A Special General Meeting of the Members of the Royal Aero Club is being held at 3, Clifford street, London, W.1, on Monday, June 29, at 6 p.m., to sanction the raising of subscriptions by £2 2s. Sir Philip Sassoon, Chairman of the Club, will preside.

Touring Committee.—Report of the Meeting held on June 3:—

Present:—W. Lindsay Everard, M.P., in the Chair; Major K. M. Beaumont, D.S.O., Major C. J. W. Darwin, D.S.O., A. H. Downes-Shaw, A. C. M. Jackaman, I. H. McClure. In attendance, H. E. Perrin, Secretary.

The Committee considered the subject of ground signs for air touring, and had before them a Memorandum prepared by Mr. I. H. McClure, which he was submitting to the Civil Aviation Section of The London Chamber of Commerce. The Committee unanimously approved the general scheme as set out in Mr. McClure's Memorandum.

The Committee were also in favour of advocating the use of Gasometers for indicating the names of the various towns. Mr. Lindsay Everard stated that, in conjunction with the Leicestershire Aero Club, he had been successful in obtaining the assent of eleven towns in Leicestershire to adopt this scheme.

Offices: THE ROYAL AERO CLUB,
3, CLIFFORD STREET, LONDON, W.1.
H. E. PERRIN, Secretary.

"Dirigible"

AFTER the inaccuracies and improbable pilots of many of the "aviation" films—wonderful though they may have been—we have so far seen, it was a real pleasure to sit through "Dirigible," a Columbia talkie, which was presented at the Tivoli Cinema, Strand, on June 15. It is a "sound" film in every sense, for the talking part is good, the story is not altogether impossible—we must allow for a certain amount of license, but we *do* object to it being taken—and the photography is excellent. Above all, it is *not* a War Film. Its main theme is the problem of airship *v.* aeroplane, centred round an expedition to the South Pole. While the airship fails in its first effort—with a really wonderful wreck scene in a storm—and the aeroplane actually reaches the Pole, but crashes there, the final rescue of the survivors of the aeroplane's crew is achieved by another airship. In making this film the producers were helped by the U.S. Government and the full use of the U.S. Airship Station at Lakehurst was accorded them, while some scenes were also "shot" at Anacostia, Pensecola, and San Diego Naval Stations. In this way some really interesting airship scenes—showing the rigid airship *Los Angeles*, several Goodyear "Blimps," and the metal-clad ZMC-2—can be seen. The aeroplane flights over the snow fields are also very fine—an effort to climb over a mountain range and the final crash on landing being particularly thrilling. There are many powerful incidents—not too much of the "sob stuff"—while there are also some good humorous parts. For instance, when the pilot of the aeroplane is just about to start for the Pole, and he goes back to the hut for his wife's letter—"to be opened on reaching the Pole"—a member of the expedition says "he's forgotten his pilot's certificate!" Yes, it is a good film, and well worth seeing.

THE NEW CURTISS-REID "RAMBLER"

A Possible Canadian Entry for King's Cup Race

THE Mk. III Inverted Gipsy engine has been responsible for a number of remarkable events, but none more pregnant than the entry of a Canadian designed and built machine in the classic King's Cup Race, which is followed as closely in the Dominion as in the Old Country itself. Readers of FLIGHT may remember that the Curtiss-Reid "Rambler" was described in these pages in the issue for June 27, 1929, and will perhaps recall that this machine is an all-metal, fabric-covered sesquiplane, with triangulated interplane strut system, and a clever inter-acting undercarriage.

The accompanying photographs of the latest product of this Montreal firm depict a machine that, while it still bears the name of its prototype, the "Rambler," outperforms the latter in every way, and is a good deal more attractive to the eye. The fitting of the inverted engine has pushed the top speed up to a conservatively claimed 126 m.p.h., and the cruising speed to upwards of 100, as well as raising the ceiling considerably. In this latter connection, it may be stated that, almost as soon as the machine was out of the shops, Capt. J. D. Parkinson, who will be remembered by thousands of English enthusiasts, took it up to an unofficial altitude record of 22,000 feet, although unseasonable cold caused his barograph to freeze at 18,000. The visibility from either cockpit has been so increased that there is no comparison. Smaller windshields are required on account of the much cleaner lines of the fuselage. The centre section is cut away forward further to increase visibility, and doors are fitted on either side of the front cockpit to facilitate entry and exit.

As the engine is mounted 9 in. forward of the old position, the undercarriage has been moved up slightly, and there is ample room now between the rear end of the power plant and the firewall that shuts off the front seat. With re-designed tail surfaces and mechanical tail-trimming, wheel-operated from either cockpit, the handling qualities of the machine are improved. A very attractive feature is the new engine cowling, each side being a single panel hinged at the top and capable of being lifted exactly like a motor-car bonnet, to a position in which it is held by a forked rod attached at its other end to the engine mounting, and folded away when not in use. With so many improvements, it seems almost a pity that this new model was not given a new designation—"Rapid" readily suggests itself.

Its pilot in the race will be Mr. John C. Webster, a popular director of the Montreal Light Aeroplane Club, who is a consistent entrant in sporting events sponsored by his club, in which he and his wife, also a member and a pilot, often pull off double events. The hopes and good wishes of fellow club members and of Montrealers at large—who are capable of an intense civic pride on occasion—will go with him in this venture. The entry is a last-minute business in more than one respect. Only a few hours remained between the time of making the decision to compete and the closing of entries. In the meantime the machine had to be flown to Ottawa to obtain its C. of A., without which the application for entry would not have been valid. A. H. S.

[*We do not quite understand our contributor's remarks regarding the shortness of time for entering this machine, as the closing date for entries is 5 p.m., June 22, while late entries may be received up to noon, July 1. On making inquiries at the Royal Aero Club, we were told that so far they had not received an official entry for this machine.*—ED.]

THE NEW CURTISS-REID "RAMBLER": Two views (front, top illustration) and three-quarter front of the new model constructed by the Montreal firm of Curtiss-Reid. It is fitted with an inverted D.H. Gipsy III engine.

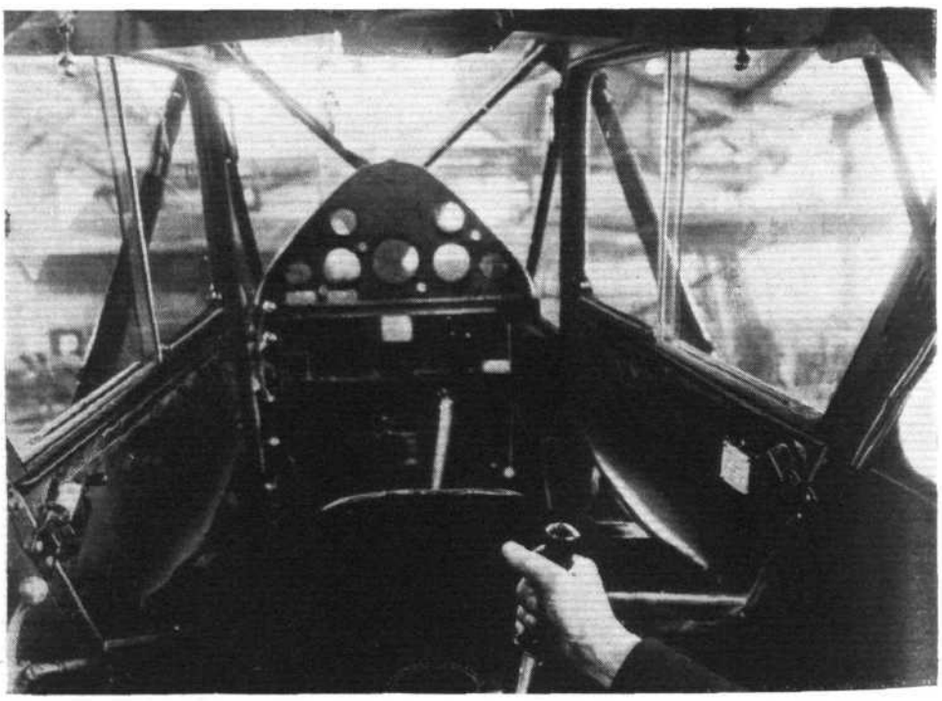
BLIND FLYING

A Cabin Aircraft which has been adapted for instruction in flying by instruments

A view from the pupils' position of the instrument board lowered. The instruments include clock, revolution indicator, air speed indicator, turn and bank indicator, altimeter, artifical horizon compass and course and drift indicator.

AS has already been mentioned in FLIGHT, the Royal Canadian Air Force has purchased several D.H. Puss Moths specially fitted for instruction in blind flying. These have proved very satisfactory for the purpose, and the spacious cabin with natural light on the instrument board has been found infinitely preferable to an open machine with a hood over the cockpit, since the mental effect of being confined in a small space is entirely eliminated. Moreover, since light is admitted to the rear part of the cabin by ground glass windows, the effect of flying in a fog is very accurately reproduced.

The Puss Moth itself is a 1931 model fitted with low-pressure wheels and brakes, or the ski undercarriage when required. The instructor occupies the front seat, while the pupil works from the rear. The special equipment consists of a dashboard with all necessary instruments, which is hinged and balanced by springs so that it can be raised or lowered in front of the pupil with ease. In the raised position, the machine then becomes the normal Puss Moth with full dual control, while in the lowered position the pupil has to fly entirely blind, due to the frosted glass side windows already mentioned. The dual controls include, of course, a tail actuating lever and throttle lever.



Another view with the instrument board raised. It will be seen that the forward view is now not interfered within in any way at all.

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Col. Sempill and London Chamber of Commerce

COL. THE MASTER OF SEMPILL has been elected deputy-chairman of the council of the London Chamber of Commerce. The new chairman is Sir Geoffrey Clarke.

Royal Aero Club's New Home

THE premises of the Cavendish Club, 118 and 119, Piccadilly, have been acquired by the Royal Aero Club.

First British Ambulance Aeroplane

MR. H. THOMAS, a director of the Bristol Aeroplane Co., Ltd., writes in connection with our reference last week to the Desoutter Ambulance aeroplane, to point out that this was not the first British ambulance machine, and that the Bristol Company produced such a machine, fitted with "Jupiter" engine, some seven or eight years ago. We stand corrected. We remember the Bristol Red Cross machine quite well, and also others, including a large Vickers ambulance. However, what we really had in mind, although it was not made clear, was a low-power ambulance aircraft such as those produced in France for many years past. These have usually been of some 100-150 h.p., and what we meant was that the Desoutter was the first of this class.

R.A.F. Revolver Championship

THE R.A.F. Revolver Championship was won, on June 4, by Flight-Lieut. George Stainforth, of the High Speed Flight, who flew over from Calshot to Bisley in his private Spartan, and returned in the same way in the afternoon.

CORRESPONDENCE

[The Editor does not hold himself responsible for opinions expressed by correspondents. The names and addresses of the writers, not necessarily for publication, must in all cases accompany letters intended for insertion in these columns.]

CAN WE FLY BEFORE WE FLUTTER?

[2746] In recent airship development one of the most striking features is the scale upon which operations are attempted. Germany, the most successful exponent of the rigid airship, is experimenting with giant craft. England has built the R.100 and the ill-fated R.101. United States is already constructing two huge craft to surpass any yet built. One ventures to observe that such large-scale developments are inherently unsound.

In any transportation scheme worked out in the modern world the custom and practice has been to start with small efforts and establish the confidence of the general public in the means provided for travel. For some unknown reason the aeronautical experts who have been in charge of airship development have adopted an entirely different attitude and method that has led to repeated disasters to huge and unwieldy air liners. The resulting impression on the public has been only too evident.

In the name of common sense why not make a beginning on a small scale? Why not give men a chance to gain experience in the handling, construction, maintenance, navigation of small airships before we send millions of dollars, dozens of valuable lives, and a heavy cargo of public confidence aloft at the mercy of inexperience? Even if a considerable number of small airships should come to grief, the resulting shock to public opinion and official sanction would not be so severe as the loss of R.101. It is to be hoped that in the near future the Air Ministry will have recovered from its recent scare, and will again attempt the use of airships. One ventures to say that if Britain were to prove successful in operating a service of small airships over a moderate distance, the influence would be greater and better directed than that exerted by any number of Transatlantic flights.

No bird flies before it can flutter. The aeroplane had to go through the infancy stage. The same law governs the airship. Unfortunately, this law does not govern the flights of imagination of those people who are in a position to influence airship development. It is to be hoped that the future will bring enlightenment without the needless loss of more of the nation's leaders.

H. G. SCOTT.

Pictou, N.S., Canada,
May 8, 1931.

[*Our correspondent has failed to realise, as a large number of people have failed to realise, that it is not possible to try out an airship of the R 101 type on a small scale. Not only would it have been impossible to produce on a smaller scale the type of steel structure used in R 101, because it would have led to the use of steel tubes, etc., of such thin wall sections as to be impracticable, but a smaller airship would have been of no practical value in itself for the kind of work for which R 101 was intended. There was no other course possible than that followed under the policy in force.*—ED.]

GROUND ENGINEERS' EXAMINATIONS

[2747] Permit me to bring to your notice the monstrous manner in which aircraft inspection is operating in this country.

Extraordinary powers have been recklessly invested in the Licensing Department of the Air Ministry, which are being used without discretion and to the extreme detriment of Civil Aviation in its most important aspect—individual enterprise.

The standard of workmanship of men granted Ground Engineers' Licences is in many instances incredibly poor, of which I have ample evidence from those who have been employed on my aircraft. I became so dissatisfied that I eventually applied for a Ground Engineer's Licence to carry out complete overhauls on those engines which I intend using for private purposes and in connection with my aero engine research, and, after having been subjected to three hours of the most impracticable and farcical form of oral examination, this licence has been withheld, apparently on an alleged insufficient practical experience with engines, while it was admitted by the examiner that my theoretical and technical knowledge far surpassed the standard necessary for a Ground Engineer. In view of the fact that I have proved in open competition and beyond doubt my claim to be one of the most practical engineers in England, can you explain a system which is allowed to continue as such a national menace?

In order to substantiate the statement above, I would point out that I have been intimately connected with internal-combustion-engine research, design, operation, and maintenance for the last 15 years. Educated at Oundle School, Northamptonshire, I was entirely responsible for the running and installation of the Curtiss OX engine supplied by the Ministry.

In 1918, I went through a most extensive course in the Engine Test and Experimental Flight Departments at the R.A.F. Farnborough, which was then working at full pressure running continuous engine tests of all allied and enemy aircraft engines, and which provided an all-round practical experience which would be very hard to obtain to-day.

Whilst at Farnborough, I dismantled the first Liberty engine that entered the country, and compiled the complete instructions as to process of dismantling and assembly which was afterwards used in the various schools, no instruction books or information being then available. After that I spent two years studying science and engineering at Cambridge, and then two years with Sir W. G. Armstrong-Whitworth's, in their Hydro-Electric Design Departments in London and Oslo, Norway, since which time I have been responsible for the original design of Sir Malcolm Campbell's Napier racing car, which still continues to use my original frame springs, cross-members, engine bearers, hubs, brakes, axles, and other details.

Since laying the foundation of the Napier, I was invited by Bentley Motors and their racing group to supercharge their cars which are now in production, and one of which broke the Brooklands track record on April 21, 1930, at a speed of 135.33 m.p.h., driven by Sir Henry Birkin, and this against all pure racing cars.

My own research racing car, the Villiers Supercharger, was shown at the leading cinemas in the Gaumont Supersound News in London and all over the country during the last two or three weeks, which photographs were taken unbeknown to me whilst in America. With this car Raymond Mays broke the Classic Hill Climb Record of Shelsley Walsh in 1929, besides having won many other races at Skegness, Southport, and other speed events.

I oppose a system of examination which does not test practically whether an engineer can use various forms of micrometers and other measuring instruments accurately, such as Brinnell and Scleroscopes, instruments which are in everyday use for checking the hardness and strength for metallic structures, and, moreover, I am opposed to an impracticable system of examination whereby the miserable candidate is furnished with neither the engine nor the blue prints, without both of which he should not be allowed to carry out an overhaul or repair. Under the present system, the engineer is encouraged to rely on his memory for the hundreds of different running fits and clearances which are so essential for the proper functioning and maintenance of aircraft motors.

This form of examination fosters a type of impractical mechanic having little but a parrot memory, which is so useful on the eve of an examination, but which stands in poor stead in the hangar or test house. What is easily gained is easily lost. Properly-prepared blue prints of all engines in use should be issued by H.M. Stationery Office containing all this accurate and important information clearly indicated. No licensed engineers should be allowed to operate without reference to the particular information which applies to the engine under consideration.

When looking back on the various racing machines in which my design of superchargers has been incorporated, such as Vauxhalls, Bugattis, A.C.'s, Bentleys, Rolls, and

Austins, it is not surprising that I should regard myself, at the age of 30, as a competent engineer.

I do not care how unpleasant this trumpet blast may sound, since it is provoked by an obstructive system which is crushing individualism and allowing our already impoverished island to disintegrate and decay. Millions of people are bitterly dissatisfied with the legalised chaos on all sides—from our smoke-infested atmosphere to the congested thoroughfares, the chaotic conditions of the mines and railroads, the inaccessibility of our air ports, and the lamentable conditions of our working people, whose stomachs are filled with hush money rather than by the organised and encouraged healthy effort of their own industry.

We cannot be expected to support indefinitely a system of bureaucracy which stands between our right to build and enjoy a better and higher form of civilisation.

Of course, the whole trouble is that the final controlling authorities should be young, practical men who fly, and not a lot of obstructive permanent officials who have been allowed by national apathy to worm their way into positions of vital national importance.

London. C. AMHERST VILLIERS.
June 3, 1931.

AN APPRECIATION

[2748] I was pleased to read in your "Croydon Notes" that the promotion of Dupe of Lympne is appreciated in aviation. There is no doubt that he has carried the aerodrome on his back for many years. Whatever time you care to land you are sure to find him there, efficient, willing, with all sorts of useful information at your service.

If you are a private owner he will fill out your Customs papers. If you want food, a "put up" for the night, a taxi, the time of a train, send a telegram or make a phone call, ask Dupe and you get satisfaction.

If you are a commercial pilot forced to land there he will shepherd your passengers, prompt the steward, arrange cars, answer a hundred and one questions, tally your cargo through Customs and get it despatched by road or rail. He is the sort we need to make aviation go.

When he *is* away, the difference is patent. A maximum of unnecessary officialism, obstruction and "pie-jaw." Long may he stay at Lympne—if only as an antidote.

"PILOT."

Lympne,
June 14, 1931.

WEATHER FORECASTS

[2749] I think it would be interesting to have an authoritative statement from the Air Ministry as to whether, at any time during the 24 hours immediately preceeding the weather conditions prevailing over the majority of England as from Sunday midday, they mentioned the possibility of such phenomena, either in the General Weather Forecast, in any particular Weather Forecast, or whether any general warning was issued subsequent to the usual reports.

RICHARD INCE.

London, E.C.2,
June 15, 1931.

"POSSIBLY OR PROBABLY"

[2750] There is a shade of difference between a statement that the Fokker F.32 is one of three possible alternatives for the Dutch East India route and one that it "will probably be used."

The first is the sense of my article in your issue of January 9 and the second that of the note which you added under the picture of the machine on page 38 of that issue and which you repeated on April 24.

The point is, perhaps, a small one, but I can quite understand Mr. Stephan's raising it.

M. LANGLEY.

Golders Green, N.W.11.
May 4, 1931.

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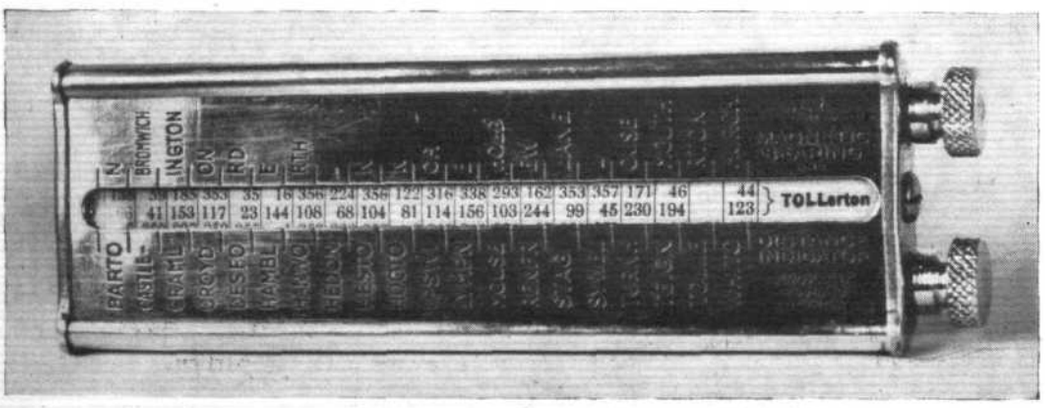
From Anywhere to Anywhere

A VERY neat instrument has just been added to the long series bearing the name of Smith's. Known as the Magnetic Bearing and Distance Indicator, type Av. 560, it consists of an aluminium casing on the front of which are engraved the names of 20 British aerodromes, and of a paper strip, wound upon two rollers, on which are printed the names of 84 aerodromes. Along the strip of paper are printed in black ink distances in miles and in red ink magnetic bearings. To find the distance and magnetic course from any of the 20 aerodromes which appear on the front of the casing to any one of the 84 aerodromes on the printed roll inside, all that is necessary is to turn the rollers until the name of the aerodrome whose bearing is wanted appears. Then, opposite the name of the aerodrome from which the start is being made, can be read off directly the distance and magnetic bearing. If the flight is being made in the opposite direction, *i.e.*, from an aerodrome, the name of which does not appear on the front, the distance can still be read off directly, but the bearing has to be calculated by either adding or subtracting 180 degrees. Altogether, 1,680 distances and bearings are given by the instrument, so that it will be seen that this neat little "gadget" will save the pilot a great deal of trouble. Weighing but 3 ounces, and measuring but 6" x 2" x ½", the indicator can be carried in the pocket, and is thus always available for instant use. The same information could, of course, have been printed on a card, but this would be very large and unwieldy, and would blow about in the wind, whereas the indicator can be used in the most draughty of aeroplanes without any trouble. The price is one guinea, and purchasers should apply direct to Smith's Aircraft Instruments, 185, Great Portland Street, London, W.1.



HOW FAR AND WHAT COURSE? Smith's Magnetic Bearing and Distance Indicator.
(FLIGHT *Photo.*)

A Greeting from India

WE have received the following letter, dated May 21, from Mr. Theo. H. Thorne, the Editor of our contemporary, *Indian Aviation* :—

"Notice has reached me to-day that the Second Trial Flight from Australia to England passes through Calcutta (Dum Dum Aerodrome) to-morrow morning. I am therefore taking this opportunity through this service of conveying to you greetings from *Indian Aviation*, which, like FLIGHT in a larger field at home, is rendering, I hope, useful assistance towards the spreading and popularising of aviation in India. It may interest your readers to know that as far as the flying sense among Indians is concerned, it is remarkably developed, and the members of the flying clubs scattered over India are constantly increasing, also the number of men who are getting their 'A' tickets is growing steadily. It is particularly interesting to note that the Government of India propose making use of 'B' ticket Indians for manning their commercial service in India when this is started. This will greatly increase the interest of Indians in flying, as it opens out a special career. The decision, too, of the Government to have an Indian Flying Air Force, manned solely by Indians, is also another feature which will help the development of aviation in India."

The AIRCRAFT ENGINEER

FLIGHT ENGINEERING SECTION

Edited by C. M. POULSEN

June 19, 1931

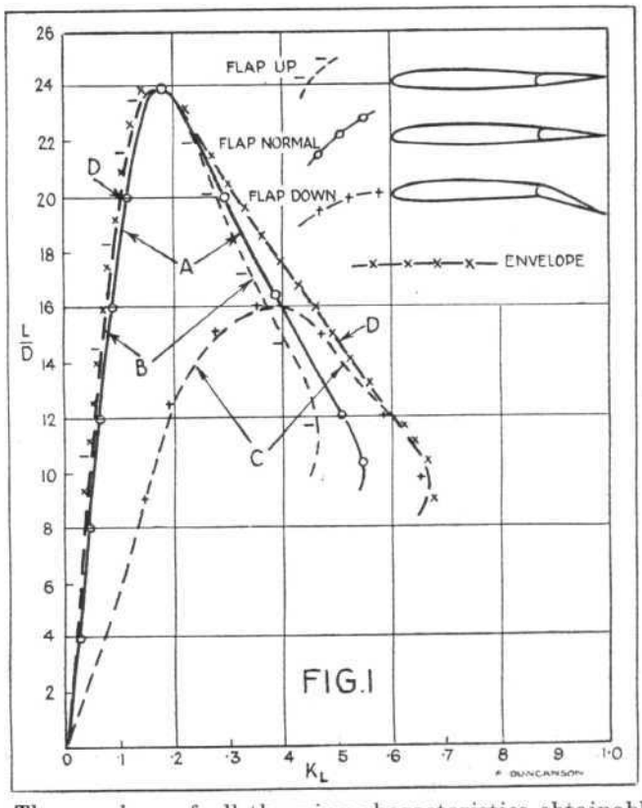
CONTENTS

VARIABLE LIFT WINGS.

By F. Duncanson, B.Sc., Wh.Ex.

Mr. Duncanson, who is on the Technical Staff of the Gloster Aircraft Company, Ltd., is no stranger to readers of The Aircraft Engineer, *as he has previously contributed articles on cantilever wings and on the influence of size on structure weight. In this issue Mr. Duncanson takes up the subject of variable camber wings, and comes to the conclusion that with modern efficient aircraft the advantages to be derived from the use of variable camber are greater than they were in the older types of machine. Mr. Duncanson estimates the weights and performance of two types of machine designed to do the same work, one with fixed wings and one with variable camber wings. He arrives at the result that the variable camber-wing machine will have a top speed some 12 m.p.h. greater than that of the fixed-wing machine, while the rate of climb is also very materially better, as are also service ceiling and absolute ceiling. In addition, Mr. Duncanson points out, the use of variable camber wings enables smaller overall dimensions to be attained, which in turn means improved manœuvrability, better view, and a reduction in fuel consumption. Mr. Duncanson does not regard variable camber gear as a means to reducing landing speed, but as a means to better performance and greater manœuvrability, and it is from this new point of view that he examines the subject.*

The primary object of employing a device whereby the section of a wing may be varied is to obtain a wing having aerodynamic qualities conducive to high speed combined with qualities that are necessary for good climb and slow landing speed. The aerodynamic properties sought are, firstly, the best possible Lift/Drift ratios at low values of K ; secondly, good L/D values at moderate values of K_L; thirdly, as high a maximum K_L as possible. These qualities are best visualised by a representation of the aerofoil characteristics on the L/D × K_L chart. On Fig. 1 are plotted the characteristics of a typical medium-lift aerofoil, shown by curve A, while the characteristics that may be obtained from this aerofoil when fitted with a trailing edge flap are shown by curves B and C, B indicating the effect of setting the flap at a slightly negative angle relative to the main portion of the wing, and C indicating the effect of setting the flap at a large positive angle.



The envelope of all the wing characteristics obtainable between the extremes illustrated in Fig. 1 is indicated by curve D. In some of the early researches on variable camber wings the envelopes indicated that much greater improvements could be obtained over the characteristics of the original section than are shown in Fig. 1, but this must be ascribed to the selection of primary aerofoils which nowadays would be regarded as very ineffieient. The proportionate gains in wing characteristics indicated by Fig. 1 are, however, quite enough in certain designs to justify the adoption of variable camber.

Results of experiments on actual machines are always more convincing than those obtained in the wind tunnel. It is, therefore, very interesting to compare the $L/D \times K_L$ curves of a complete aeroplane for the normal wing and for various flap settings, as shown on Fig. 2. These curves are constructed from data given in R. and M., No. 1085.*

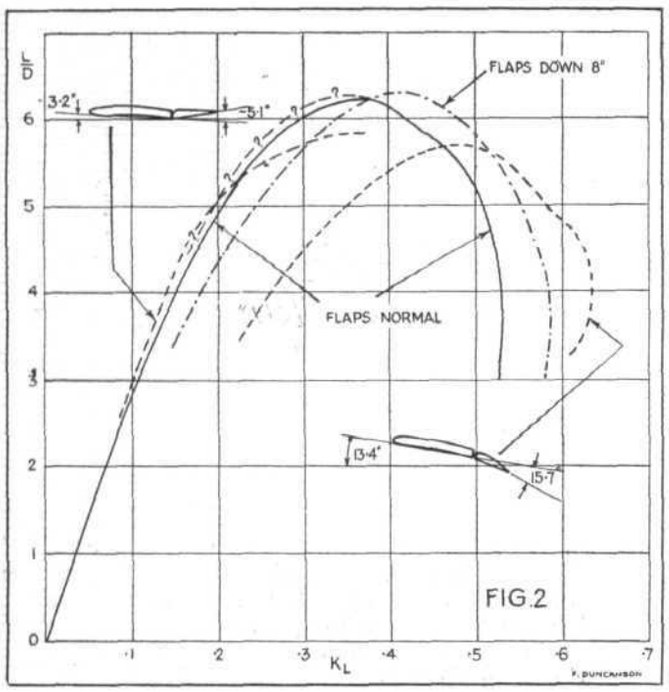


FIG.2

This report gives figures of carefully-measured lift and drag of the complete aeroplane with propeller stopped, at flap settings of −5.1°, 0°, 8° and 15.7°. It is thought that an intermediate setting between −5.1° and 0° may have given a curve in about the position shown by ? ? ?.

It will be seen from the above that the effect of flaps on the maximum lift of the original aerofoil is to increase this by about 20 per cent. For a comprehensive discussion of the present state of development of variable camber the reader is referred to Capt. Macmillan's very able and interesting article which was published in THE AIRCRAFT ENGINEER of June 20, 1930.

The object of the present article is to consider the advantages of variable camber from different points of view, and to suggest new avenues for research and development work.

In the case of modern designs of aircraft where a high degree of aerodynamic efficiency is being obtained, the wing drag is now a greater proportion of the total drag of the machine than was formerly the case. Any improvement in the characteristics of a wing will therefore result in a greater proportionate improvement in the performance of a modern aircraft than would be achieved in the case of an obsolete design. Another important advantage of variable camber flaps in the case of modern highly efficient aircraft is their effect in coarsening the extremely flat gliding angle, which is characteristic of these machines, when coming in to land, so that apart from their effect in reducing landing speed, they give a useful effect as air brakes.

A combination of variable camber wings with leading edge slots gives very great advantages, inasmuch as the full benefit of slots in reducing landing speed is only obtained at angles so large as to be unattainable in normally proportioned aircraft, whereas the two in combination result in a high lift being obtained at the normal attitude the machine would take in an ordinary three-point landing. The lift obtained by the combination of flap and slot is, moreover, higher than that obtainable with slots alone.

* Lift and Drag of the Bristol Fighter with Fairey variable camber wings.

This point is illustrated by Fig. 3, which is replotted from the diagram published in "Flight" of March 7, 1930, page 270. Assuming that a wing incidence of 17° may be obtained by a machine of normal proportions during a three-point landing, a slotted wing would have its K_L increased from 0.54 to 0.61 at this incidence, *i.e.*, a 13 per cent. increase, whereas an increase to 0.87,

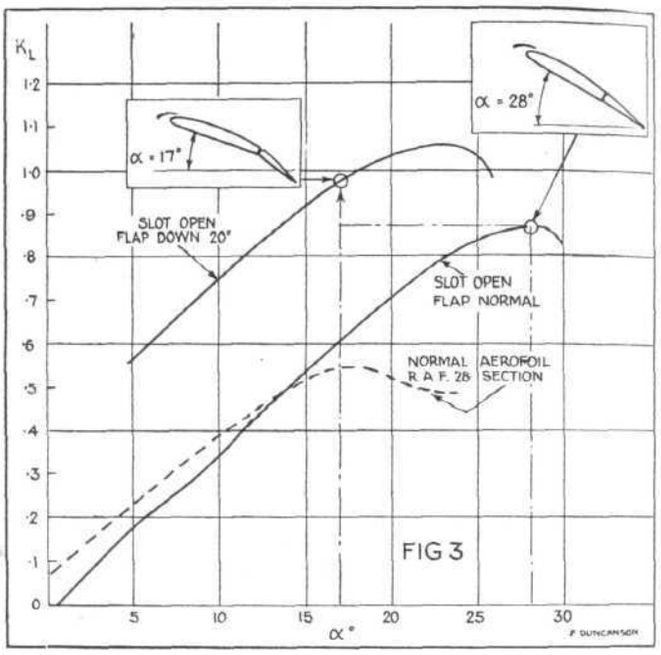


FIG 3

representing a 61 per cent. improvement, is inherent in the wing but cannot be used, the required wing incidence being 28°. When the slot and variable camber flap are combined, however, the K_L at 17° is increased to 0.98, representing an 85 per cent. gain.

It is obvious that no form of variable lift wing is worth adopting unless lateral control is both light and effective at and beyond stalling speed; in this connection it is pleasing to note that in the case of variable camber wings recently tried it was found that the lateral control was effective throughout the speed range of the machine and at all variations of wing section, and that the ailerons felt even lighter with full camber than with flaps normal. It must also be borne in mind that whatever be the devices used to augment the lift of the wing, these must be so arranged that for high-speed conditions the profile of the wing is not interfered with to any appreciable extent. This object may be achieved by careful attention to detail design.

In order to obtain the maximum possible benefit from the use of variable camber, this should be regarded not as a means for reducing the landing speed of existing machines, but as a means for reducing their overall size and weight, and increasing performance and manœuvrability, while still retaining a reasonably slow landing speed.

To illustrate this new point of view we will make a comparison between two aircraft, both designed for the same purpose, one with fixed wings, which will hereinafter be referred to as the F.W. machine, and the other with variable camber wings, which will be referred to as the V.C.W. machine, on the basis of the same landing speeds for both designs. The wing section selected for both cases will be R.A.F. 28. For the purpose of this example a hypothetical specification will be adopted, the leading requirements of which are:—

(1) Stalling speed, 55 m.p.h.
(2) Maximum speed at 10,000 ft. to be not less than 160 m.p.h.
(3) Military load, 1,200 lb.
(4) Duration, 6½ hours at a cruising speed of 130 m.p.h.
(5) Span not to exceed 44 ft.

With regard to the F.W. machine, we arrive at an estimate of the all-up weight by first of all assuming that the total weight of a suitable water-cooled engine installation of 500 to 600 b.h.p. is 1,350 lb., to which is added the military load, fuel and oil, having a total weight of 2,500 lb. The weight, less structure, is therefore 3,850 lb. From experience with similar designs we know that the structural weight will be of the order of 34 per cent. The total weight of the aircraft will therefore be:—

$$\text{W.F.W.} = \frac{3{,}850}{0.66} = 5{,}840 \text{ lb.}$$

Theoretically, the K_L max. of a R.A.F. 28 Biplane, with what little help is obtained from the top wing slots, will be 0.57; but in practice we know that a K_L at the stall of 0.63 will be realised. (Throughout this investigation, in order to be on the safe side, the benefits of any doubts, such as this, are given in favour of the F.W. machine.)

The wing loading appropriate to this K_L max. and the stalling speed of 55 m.p.h. is 9.7 lbs. per sq. ft. The wing area will therefore be 602 sq. ft. The F.W. aircraft is illustrated in side view by Fig. 4, in front view by the left-hand side of Fig. 5 and in plan view by Fig. 6. The average aspect ratio of the wings turns out to be exactly 6, and it is obviously possible to make the wings of the single-bay type.

Turning now to the alternative V.C.W. machine, the K_L max. (after allowing for the fact that it is inconvenient in this particular design to employ slots over more than just over half the wing span, and correcting for aspect ratio and scale effect) works out to be 0.89. The wing loading for a stalling speed of 55 m.p.h. will, therefore, be 13.7 lb. per sq. ft. The total weight, area and wing proportions of the V.C.W. machine have been arrived at by successive approximations, and the results are:—

$W_{\cdot VCW}$ = 5,500 lb.; wing area = 401 sq. ft.

The saving of weight of 340 lb., as compared with the F.W. aircraft, is made up as follows:—

The F.W. wing weighs 1.4 lb. per sq. ft., so that the wing weight is 1.4 × 602 = 844 lb.

The V.C.W. wing weighs 1.84 lb. per sq. ft., so that the wing weight is 1.84 × 401 = 737 lb.

844 − 737 = 107 lb. = saving in wing weight.

The reduced chord of the V.C.W. machine results in reduced fuselage length, greater concentration of masses and lighter stresses, and the consequent saving of fuselage weight, calculated on conservative assumptions, has been found to be 96 lb. The V.C.W. machine will achieve the required duration on 137 gallons of fuel as against 155 gallons in the case of the F.W. machine. The saving in fuel alone will, therefore, account for a further weight reduction of 137 lb. There will also be several small weight reductions in other components of the machine, such as the petrol tanks, piping, controls, tail unit, etc., but to be on the safe side these reductions will be neglected. The weight estimate of the V.C.W. machine will therefore be:—

$W_{\cdot VCW}$ = 5,840 − (107 + 96 + 137) = 5,500 lb.

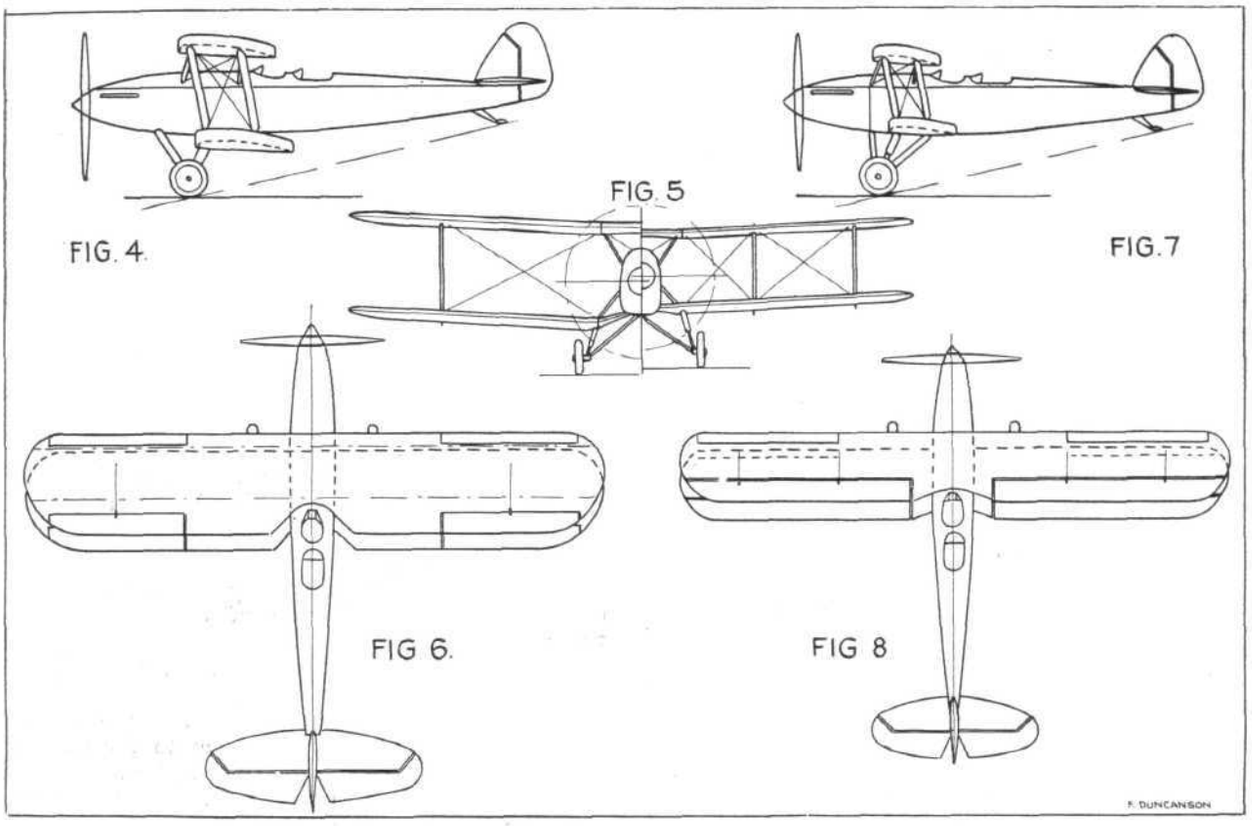
The V.C.W. aircraft is illustrated in side view by Fig. 7, in front view by the right-hand side of Fig. 5 and in plan view by Fig. 8.

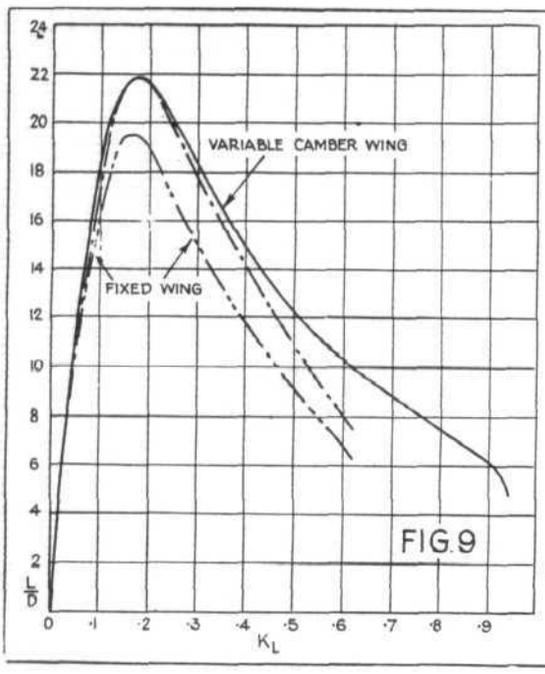
An appropriate wing design is found to have the following proportions:—Span 41 ft. 6 in.; chord, 5 ft. 3 in.; mean aspect ratio, 8.

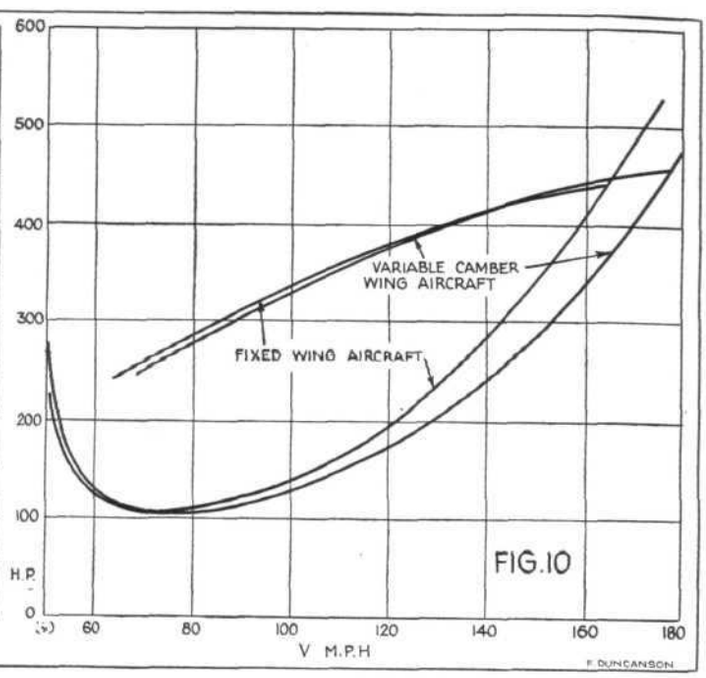
It is obvious that a two-bay wing structure is necessary in this case. This does not mean that any appreciable aerodynamic loss need be feared, provided that care is exercised in streamlining. Evidence in support of this statement may be found in the case of the Gloster Multi Gun Fighter, whose performance is phenomenal in spite of the handicap of a radial air-cooled engine, large military load and additional drag of wing guns.

The biplane wing characteristics of each design, corrected from the monoplane tunnel figures by means of the standard Prandtl methods, are shown plotted on Fig. 9.

The parasitic drags of the two alternatives have been summed up in the usual way, and in this connection it should be noted that in spite of the V.C.W. machine having a more favourable body fineness ratio and







greater clearance between the wheels and bottom plane, to be on the safe side, no advantage has been taken of these indications of reduced drag coefficients in favour of the V.C.W. alternative.

The performances at sea level of the alternative machines are shown superposed on Fig. 10, while the performance particulars with respect to height are shown graphically by Figs. 11 and 12.

The following table summarises the leading particulars of these alternative aircraft:—

	Fixed Wing Aircraft.	*Variable Camber Wing Aircraft.*
Span (both planes)	44 ft.	41 ft. 6 in.
Overall length	36 ft. 6 in.	32 ft. 3 in.
Overall height	12 ft. 6 in.	11 ft. 6 in.
Chord	7 ft. 6 in.	5 ft. 3 in.
Main plane area	602 sq. ft.	401 sq. ft.
Total weight fully loaded	5,850 lb.	5,500 lb.
Wing loading	9·7 lb./sq. ft.	13·7 lb./sq. ft.
$\frac{\text{Span}^2}{W}$*	0·331	0·313
Airscrew diameter	11 ft.	10 ft. 6 in.
Speed at s.l.	165 m.p.h.	177·5 m.p.h.
Speed at 5,000 ft.	164 m.p.h.	176·7 m.p.h.
Speed at 10,000 ft.	162 m.p.h.	174 m.p.h.
Speed at 15,000 ft.	155·3 m.p.h.	168 m.p.h.
Rate of climb at s.l.	1,130 ft. per min.	1,250 ft. per min.
Rate of climb, 10,000 ft.	560 ft. per min.	640 ft. per min.
Time to 10,000 ft.	12·6 min.	11·2 min.
Service ceiling	19,000 ft.	20,250 ft.
Absolute ceiling	21,000 ft.	22,200 ft.
Alighting speed	55 m.p.h.	55 m.p.h.

* The span loading is more favourable to the F.W. than to the V.C.W. aircraft.

Apart from the higher performance of the V.C.W. machine, the following advantages are naturally obtained from this design:—

(1) Smaller overall dimensions.

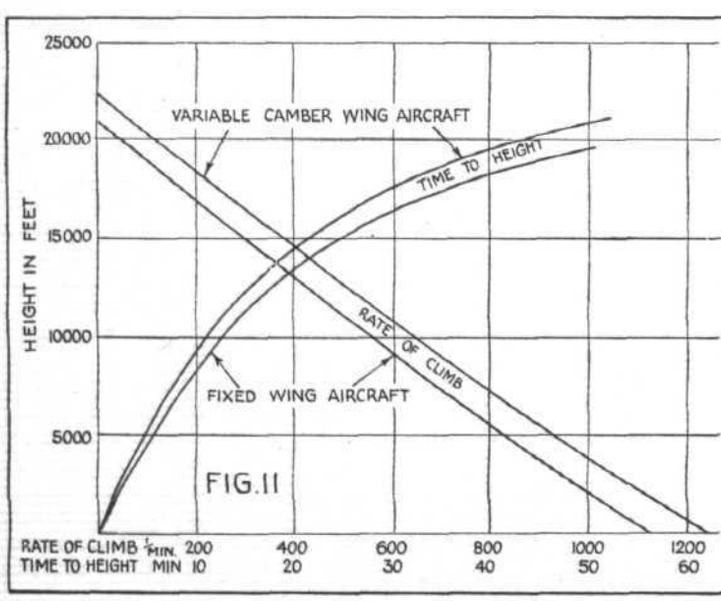
(2) Improved manœuvrability on account of the decreased moments of inertia of the aircraft about all three axes.

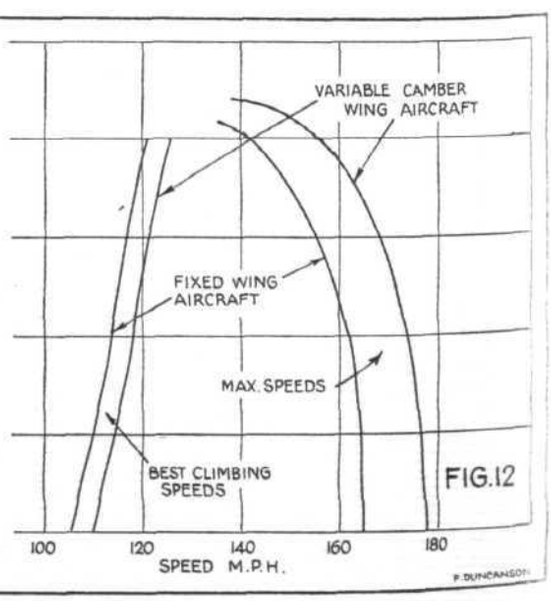
(3) Pilot's view greatly improved, not only because of the narrower top and bottom wing chords, but because the smaller gap enables the top wing to be placed at such a position relative to the cockpit that the edge view only is visible to the pilot.

(4) Reduced fuel consumption. (In the example chosen this amounts to 11.5 per cent.)

As time goes on the need for the adoption of variable lift devices becomes more and more apparent, since increased performances and greater useful loads are continually being demanded. Substantial advantages may be obtained in practically every type of aircraft, and the application of variable camber, already in an advanced state of development, is susceptible of still further improvements regarding such matters as effective lateral control and simplicity of design.

The author wishes to acknowledge his indebtedness to the Controller of H.M. Stationery Office and to the Secretary of the Aeronautical Research Committee in connection with the preparation of this article.





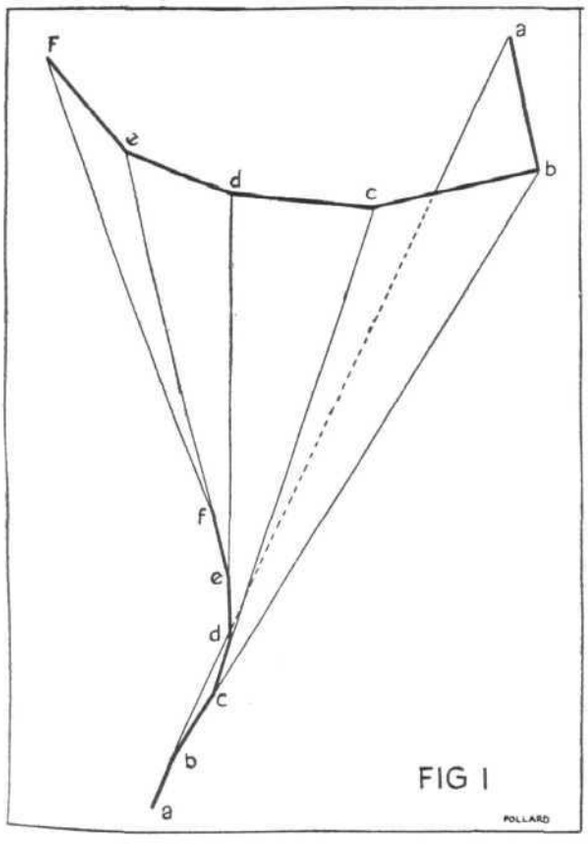
METAL CONSTRUCTION DEVELOPMENT.

BY H. J. POLLARD, Wh.Ex., A.F.R.Ae. Soc.

"Developable Surfaces."

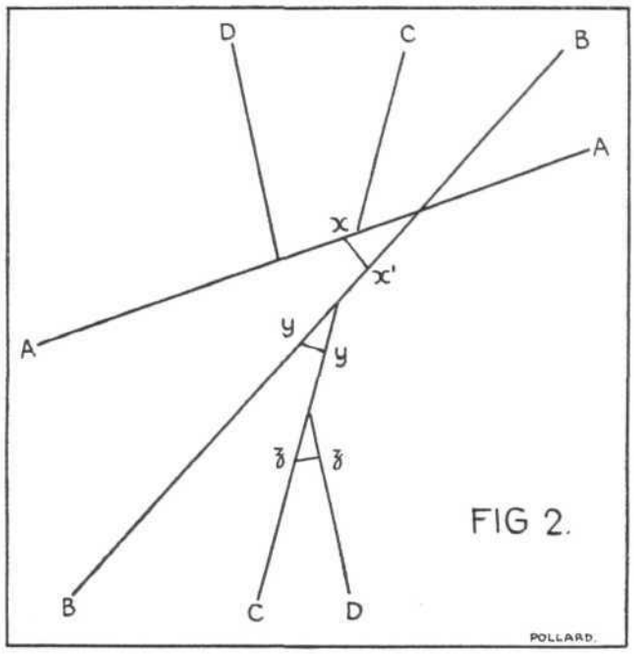
Apart from designs of foreign importation, metal construction development in this country has in the main been concerned with framed structures, chiefly girders of the strut and wire type, occasionally with girders rigidly braced, the desired external surfaces being obtained by fairing, generally with non-structural material.

We need not concern ourselves here with the reasons why the long established principle of girder construction has been retained; suffice it to say that the problem of the substitution of structural components made from high-tensile steel presented enough problems in itself without the additional complication of innovations in overall structural design. There is now, however, an insistent demand for the utilisation of surface material for bearing parts of the structure stresses, and aircraft structural engineers are studying the problem. It is not intended, at this stage, to discuss the possible merits or demerits of "monocoque" structures, but rather to place before the reader certain general considerations relating to the shapes of surfaces intended for "rigid" covering.



It is obviously very desirable that the contour of a surface to be covered by metal sheets should, wherever possible, be such that a flat sheet of the covering material may, on being laid on the surface, conform thereto without any stretching or without the necessity of cutting up into smaller pieces in order to eliminate folds, crinkles or buckles in the finished covering. A curved surface which can be "opened out" and laid flat without tearing, crumpling or stretching is known as a "developable" surface. A few general observations regarding such surfaces are appropriate.

A clear conception of a developable surface may be obtained by taking a flat piece of fairly stiff paper and holding it by one corner. The suspended sheet is not appreciably stretched in any way under its own weight, and the surface thus formed becomes plane when the sheet is again laid flat on the table. In the case of a piece of fabric so held, apart from any flexure at the



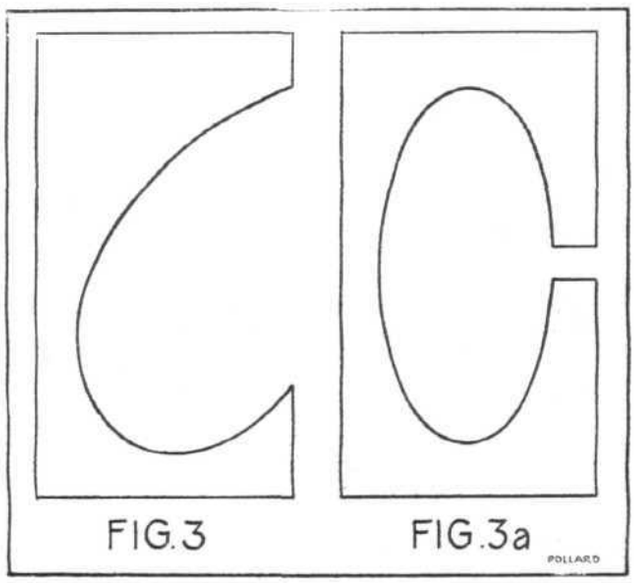
point of suspension or elsewhere, the material is very extensible in any direction (other than parallel to the warp or weft) under small forces. It is thus admirably suited to stretching over surfaces which could not be covered by more rigid materials without costly stretching operations or the use of a large number of small pieces.

The section of Descriptive Geometry dealing with developable surfaces may not be familiar to most readers, but the following explanation of the more usual terms may be useful if it is desired to pursue this interesting subject in the standard works.

The most familiar curved surfaces which are developable are those of the cone and the cylinder. Other surfaces are the hyperbolic paraboloid and the hyperboloid of one sheet; these belong to a general class of surfaces called Ruled Surfaces, and can be generated by the motion of a straight line, or, alternatively, they are surfaces through any point on which a straight line can be drawn lying wholly on the surface. Such a line is known as a generating line. There are two classes of ruled surface:

1. Those in which each generating line intersects that which is next consecutive.
2. Those in which each generating line does not intersect that which is next consecutive.

In Fig. 1, *aa*, *bb*, *cc*, etc., are a series of straight lines, each consecutive pair intersecting in points, *a*, *b*, *c*, etc. Since *aa*, *bb* intersect, they lie in the same



plane. Similarly, with the other pairs of lines. Therefore a surface is obtained composed of a series of triangular planes *aab*, *bbc*, etc. The first of these plane surfaces bounded by lines *aa* and *bb* may be bent round line *bb* until it lies in plane *bcc*. This larger flat surface may be bent round line *cc*, and so forth until the polygonal surface is developed into one single plane.

the planes are intersecting straight lines forming a developable surface as described in connection with Fig. 1.

A short consideration of the second class of ruled surfaces will help the reader to a clearer understanding of the whole problem.

In Fig. 2 we have a representation of a series of lines

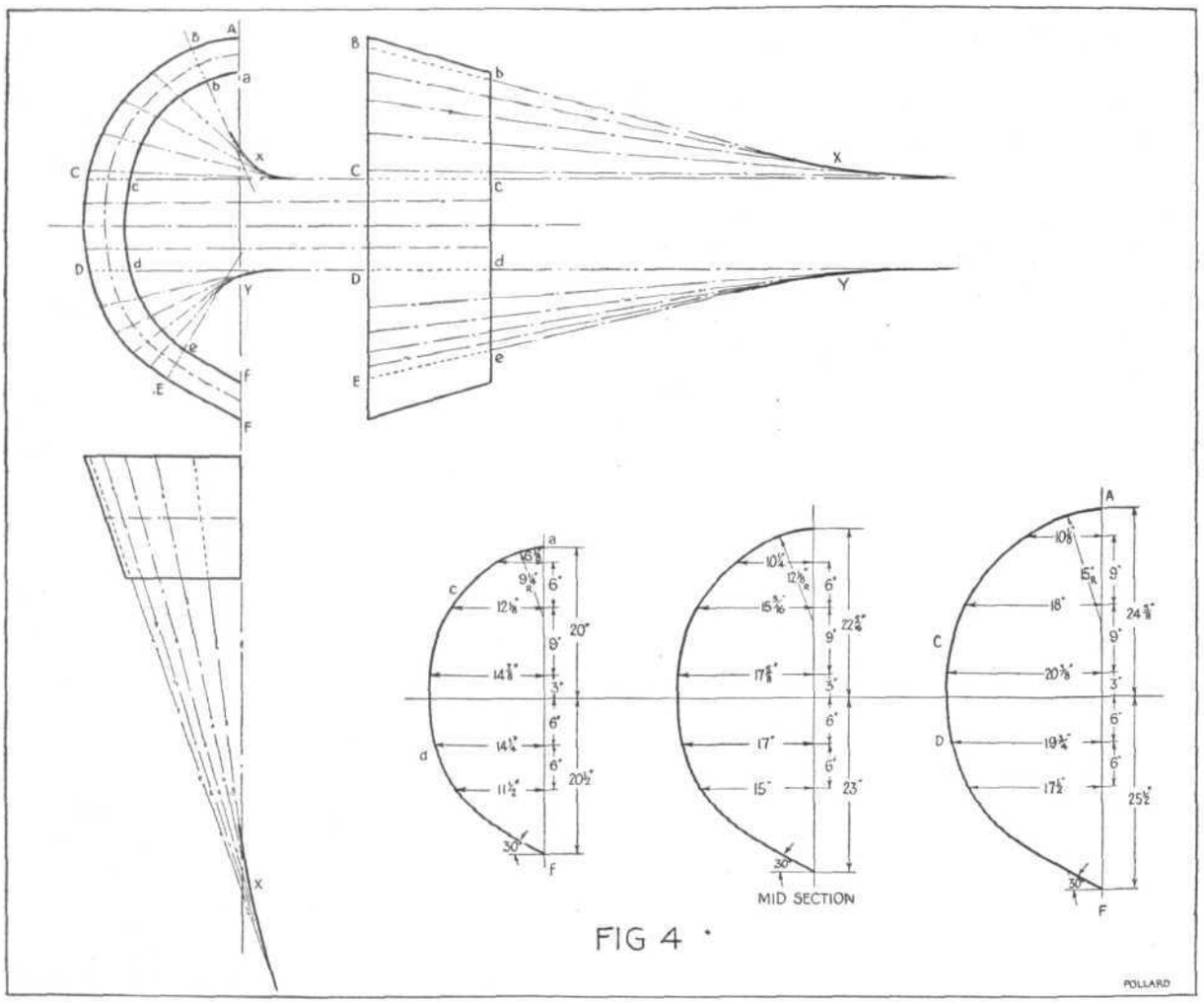


FIG 4

Definitions of the terms used are, perhaps, made clear by putting the above statement into mathematical language. Since two consecutive generating lines intersect, they lie in one plane, and a surface such as the above may be produced by the ultimate intersections of a series of planes, and since any two consecutive planes intersect on a line on the surface, the equation representing any one of the series of planes can involve only one arbitrary constant. To make this clear

Let the equation of any surface be

$$f\ (x,\ y,\ z,\ a)\ =\ 0 \quad \ldots\ldots\ldots\ldots\ldots(1)$$

where a is a constant.

Let a be changed to a_1 then the equation is

$$f\ (x,\ y,\ z,\ a_1)\ =\ 0 \quad \ldots\ldots\ldots\ldots\ldots(2)$$

This simply means that equations (1) and (2) represent surfaces of the *same shape*, but differing in size or position, or both.

If the surfaces intersect, then all parts on the curve of intersection are satisfied by the above equations. If a_1 is made to approach very near to a then the curve approaches some limiting position, and the locus of all such limiting positions for different values of "a" is a surface which is called the envelope of the family of surfaces (1).

If either x, y or z in the above equation be made zero, that is if the surface is a plane, the arbitrary variation in the value of a_1 may be termed giving the plane one degree of freedom, and the trace of the intersections of AA, BB, etc., in space. The line AA lies above BB, BB above CC, and CC above DD; none of the lines intersects the other, and xx^1, yy, etc., are the shortest distance between these lines. The nature of the surface can best be seen by imagining line BB rotated about x^1 until both lines (AA and BB) lie in one plane. If this is taken to be thin metal, then, obviously, when BB is rotated back to the position shown in Fig. 2, every connecting line must be stretched except the shortest line xx^1. This, therefore, is not a developable surface, but is known as a skew surface, or scroll. We shall not deal further with this class of ruled surface.

Returning to the definitions, the generating lines shown in Fig. 1 intersect in the polygon *b*, *c*, *d*, etc., whose sides are in the direction *bc*, *cd*. This polygon approximates closer and closer to a continuous curve as the generating lines become nearer together, and in the limit is a true curve. This curve is called the *Edge of Regression* or *Cuspidal Curve*. The curve is always tortuous, *i.e.*, the plane containing two sides of the original polygon does not in general contain the next side.

This plane, which contains two sides of the polygon, of which the tortuous curve (the edge of regression in our Fig. 1) is the limit, in its final position is known as the *osculating plane* of the curve at the particular point. As two successive positions of it contain the second side of the polygon, then clearly the osculating plane passes from one position to the next by revolving round the tangent to the curve, and it is evident as

explained above that the *envelope* of the *osculating plane* to a twisted curve is a developable surface.

Before demonstrating how the tangential property of the tortuous curve may be utilised in laying out a developable surface, it may be helpful to make one or two further observations on such surfaces.

In the case of a cone it is obvious that there are two developable surfaces, for the generating lines lying on one surface pass through the vertex forming a second conical surface. Similarly with the tangents to an edge of regression; these pass either side of the curve, forming a second developable surface, or, as it is called, a surface in two sheets.

The method of construction of such a developable surface is given in Thompson & Tait's Natural Philosophy and is as follows:—

"Lay one piece of perfectly flat, unwrinkled, smooth-cut paper on the top of another. Trace any curve on the upper, and let it have no point of inflection, but everywhere finite curvature. Cut the paper quite away on the concave side (see Fig. 3). If the curve traced is closed, it must be cut open (see Fig. 3A). The limits to the extent that may be left uncut away are the tangents drawn outwards from the two ends, so that, in short, no portion of the paper through which a real tangent does not pass is to be left."

"Attach the two sheets together by very slight paper or muslin clamps gummed to them along the common curved edge. These must be so slight as not to interfere sensibly with the flexure of the two sheets. Take hold of one corner of one sheet and lift the whole. The two will open out into the two sheets of a developable surface, of which the curve, bending into a curve of double curvature, is the edge of regression. The tangent to the curve drawn in one direction from the point of contact will always lie in one of the sheets, and its continuation on the other side in the other sheet. Of course a double-sheeted developable polyhedron can be constructed by this process, by starting from a polygon instead of a curve."

As we have seen, a ruled surface may be developed into a plane when all its generators are tangential to the same curve. This is the fundamental fact in what follows.

The basis of the method is to draw lines upon three views of the surface (required to be developed) in proper projection. The intersection of the lines form cuspidal curves, and these cuspidal curves must be in projection, *i.e.*, the points of tangency of the projection of the generators with the cuspidal curve must be in projection, or the curves or generators altered until such agreement is obtained. It then remains to pick off, from the three views, suitable sections or formers over which the developable covering can be laid.

The bounding lines or curves of a developable surface are known as the directrices. In demonstrating the method of determining a developable surface we will choose, for the sake of simplicity, a body in which the directrices are parallel or at right-angles to the planes of projection. In cases where the directrices are tortuous curves, the choice of suitable planes of projection is often a difficult matter, and the process may be tedious. The fact that the generators must, as well as being tangent to the cuspidal curve, also be tangent to the directrices must not be overlooked, and, although this can be verified at once when the directrices are parallel to the planes of projection, yet when the directrices are tortuous this may not be seen in the usual planes of projection, and additional planes are necessary. These have been chosen so that proper contact with the directrices is assured. Nothing more is involved than the ordinary rules of projection, although the use of several planes of projection will be necessary, chosen arbitrarily.

This simple example will take the form of the fuselage shown in Fig. 4. To save space the longitudinal scale in side view is smaller than for the other views.

A, B, C, D, E, F and *a*, *b*, *c*, *d*, *e*, *f* are the bounding plane surfaces. We will assume that in the layout it has been possible to make portions AB*ab* a cone, C*c*D*d* cylindrical and EF*ef* a plane surface, but that BC*bc* and B*d*E*e* can take the form of none of these simple surfaces; yet they are required to be developable.

In the first case, the surface is bounded by directrices BC and *bc* and generators B*b*, C*c*. These latter lines (shown dotted) form the terminal tangents to the edge of regression *x*. Other generators are drawn, and these together with the edge of regression formed are projected on to the other two planes, and adjustments made until the projection is accurate. Similarly with surface D*d* E*e*. In this latter case the plan view of the edge of regression has been omitted for clearness; the cuspidal curve is marked Y for this portion.

Finally the ordinates for as many additional sections as may be considered necessary are obtained. In the above case only one intermediate section has been chosen. In the case of the plane, conical and cylindrical portions of the whole surface, the ordinates or radii and angles are merely the mean of the corresponding dimensions of the extreme faces, but the ordinates for the other parts of the mid section are scaled from the points of intersection of the appropriate generators and the plane of the section required.

It must be clearly understood that aerodynamic and operational requirements of, say, a fuselage, may preclude the use of a developable covering. This is usually at once obvious, but if a doubt exists then the application of the principles explained in this article quickly decides the matter. Moreover, the necessary modifications or alternative compromises between the aerodynamic and constructional considerations are made clear.

Finally, it should be understood that considerable practice by an expert draughtsman working on large-scale drawings is required before results can be obtained with rapidity and precision, but in view of the practical advantage to be derived from application of the process, such expense in design as may be incurred is justifiable.

TECHNICAL LITERATURE

SUMMARIES OF AERONAUTICAL RESEARCH COMMITTEE REPORTS

These Reports are published by His Majesty's Stationery Office, London, and may be purchased directly from H.M. Stationery Office at the following addresses: Adastral House, Kingsway, W.C.2; 120, George Street, Edinburgh; York Street, Manchester; 1, St. Andrew's Crescent, Cardiff; 15, Donegall Square West, Belfast; or through any Bookseller.

SPINNING EXPERIMENTS ON A SINGLE-SEATER FIGHTER. PART I. FURTHER MODEL EXPERIMENTS. By A. S. Batson, B.Sc., and H. B. Irving. B.Sc. PART II. FULL-SCALE SPINNING TESTS. By S. B. Gates, M.A. R. & M. No. 1278. (Ae. 424.) (10 pages and 12 diagrams.) August, 1929. Price 9d. net.

The single seater fighter which is the subject of this report is a staggered biplane, which in its early forms gave difficulty in recovery from spins. One of these forms has already been the subject of model tests and a report.* Later forms, in which modifications have been made to the body and tail, are here mainly dealt with. The model tests were made on a form of the machine in which, not only were fin and rudder areas increased, but the body was lengthened and the tailplane raised from the middle to the top of the rear portion of the body. These modifications resulted in greatly enhanced damping moments due to body, fin and rudder while rolling, roughly as much of the increase being caused by the lengthened and deepened body as was due to the enlarged fin and rudder. The raising of the tailplane contributed in no small measure to these increases of both body and fin and rudder moments.

* R. & M. 1184. Experiments on a model of a Single Seater Fighter Aeroplane in connection with Spinning. Irving and Batson.

The full-scale experiments made at the Royal Aircraft Establishment showed that these modifications had considerable effects on the spinning of the machine, but, although no actual difficulty in recovery was found, recovery was slow, 3—4 turns. Previous experiments at Martlesham with a slightly smaller fin and rudder had shown that danger had not been entirely eliminated; so that even with the larger fin and rudder, the machine could not be regarded as having been far removed from the danger point.

A SYSTEM FOR THE AUTOMATIC TIMING OF AIRCRAFT OVER A SPEED COURSE. By J. K. Hardy, B.A., and K. V. Wright, B.A., with an appendix by S. B. Gates, M.A. Communicated by the Director of Scientific Research, Air Ministry. R. & M. No. 1343 (Ae. 475). (9 pages and 9 diagrams). February, 1930. Price 1*s.* net.

Accurate timing of an aircraft over a speed course with watches, by observers stationed at either end of the course, has been found unsatisfactory even when the most elaborate precautions have been taken. A system has been devised which eliminates the errors, both human and instrumental, that were associated with the older system. In this, the timing counting mechanisms at either end of the course are controlled by a single instrument.

A detailed account is given of the apparatus for this system, which was developed for measuring the speeds of racing seaplanes over the 3 kilometre course at Calshot during 1929. Two cinema cameras were used and these, in addition to recording the passage of the aircraft at either end of the course, by a series of photographs, recorded the time at which each exposure was made in terms of vibrations of a tuning fork, which was in electrical connection with counters in both cameras.

The apparatus, which is built up from commercially produced components, has proved very reliable in service. The accuracy with which the time of any one transit of the aircraft can be determined is not less than 1/20 second, so that speeds of about 350 m.p.h. over 3 kilometres may be measured to the nearest ½-m.p.h. This is sufficient for experimental work, but it could be considerably improved by a modification to the design of the apparatus if occasion demanded. The necessary modifications are briefly discussed, and two alternative schemes outlined. A theory of time determination for an apparatus functioning ideally on the principle of the present design is given in an Appendix.

THE APPLICATION OF THE METHOD OF OPERATORS TO THE CALCULATION OF THE DISTURBED MOTION OF AN AEROPLANE. By L. W. Bryant, A.R.C.Sc., and D. H. Williams, B.Sc. R. & M. No. 1346. (Ae. 478.) (13 pages.) July, 1930.

In the theoretical investigations of low speed control and spinning the problem arises of how best to compute rapidly the motion due to applied forces and couples.

The method of operators has been found of great utility in dealing with this problem. The method appears to be due to Heaviside in the first instance* and Bromwich established its validity. In the present note a treatment of simultaneous linear differential equations of the first order is given, following a presentation given by Jeffreys in a recent mathematical tract. The eight simultaneous equations defining the general motion of an aeroplane in three dimensions are taken as an example in discussing the method, and the types of solution corresponding to real, complex, and repeated real roots of the stability equation are indicated.

The cases of lateral and longitudinal disturbances from steady straight flight are considered in detail, and the operational forms in terms of the derivatives are given expanded ready for computation.

* "On Operators in Physical Mathematics," Proc. Roy. Soc. A.52, 1893, and 54, 1894.

ON THE VALIDITY OF LARGE SCALE TESTS IN AN OPEN JET WIND TUNNEL. TESTS ON ONE-FIFTH SCALE BRISTOL FIGHTER IN 5 FT. OPEN JET TUNNEL. By W. G. A. Perring, R.N.C., and C. Callen. Communicated by the Director of Scientific Research, Air Ministry. R. & M. No. 1348 (Ae. 480). (12 pages and 9 diagrams.) July, 1930. Price 9*d.* net.

The tests were undertaken to investigate the possibilities of experiments in an open jet tunnel upon aeroplanes of wing span greater than the jet diameter. Interest in the tests was chiefly concerned with the measurement of changes in the force along wind, due to changes in the parts of the aeroplane situated near the centre of the jet.

The tests were carried out in a 5 ft. open jet tunnel* on a one-fifth scale model Bristol Fighter. Lift and drag without airscrew, and with stopped airscrew, and the lift and nett thrust with airscrew running have been measured at angles of incidence varying from —4° to 8°. From the results the pitching moments have been calculated, the additional drag due to a stopped airscrew has been deduced and the effective thrust of the airscrew has been determined. The results are compared with those for similar tests carried out on the same model in the Duplex tunnel at the National Physical Laboratory, Teddington.

In addition, some exploration of the jet was made with the model in position.

The tests have demonstrated the possibility of measuring in an open jet wind tunnel, the changes of drag or thrust resulting from modifications to parts of the aeroplane situated near the axis of the jet, even when the aeroplane span greatly exceeds the jet diameter.

* R. & M. 1364. The 5 ft. open jet wind tunnel, R.A.E.—F. B. Bradfield.

ON RENDERING AIRFLOW VISIBLE BY MEANS OF HOT WIRES. By H. C. H. Townend, B.Sc. R. & M. No. 1349. (Ae. 481.) (5 pages and 5 diagrams.) October, 1930. Price 9*d.* net.

This paper describes a method of delineating the flow pattern round bodies mounted in an airstream by means of fine wires electrically heated, similar to the well-known hot wire anemometers.

If such a hot wire is placed normally to a current of air, it is found that the thin band of heated air in its wake persists coherently for some distance downstream and that due to its reduced density it will cast a shadow on a screen if suitably illuminated.

Some experiments have been made to explore the possibilities of this as a method of observing air flow, and a few photographic reproductions show the kind of results obtainable.

REPORTS AND MEMORANDA PUBLISHED BETWEEN SEPTEMBER, 1929, AND DECEMBER 31, 1930. R. & M. No. 1350. (8 pages.) January, 1931. Price 6*d.* net.

This is a list of all the Reports and Memoranda published by the Aeronautical Research Committee between September 1, 1929, and December 31, 1930. Previous lists of the Committee's published papers are Reports and Memoranda 650, 750, 850, 950, 1050, 1150 and 1250. For a classified list of reports on sale as separate issues, with prices, see List B, for which application should be made to H.M. Stationery Office.

Most of the Memoranda have been or will be published in the annual technical volumes. The remainder are published in special monographs.

THE AIR FLOW AROUND A SYMMETRICAL AEROFOIL. By T. Tanner, A.C.G.I., D.I.C. Communicated by Professor L. Bairstow, C.B.E., F.R.S. R. & M. No. 1353. (Ae. 484.) (11 pages and 58 diagrams.) July, 1930. Price 1*s.* net.

The object of this investigation, which was undertaken at the Royal College of Science at the suggestion of Mr. W. S. Farren, was to determine the velocity of the air, both in magnitude and direction at all points in the field around an aerofoil and to find from this, according to the circulation theory, the value of the lift coefficient, with a view to forming a basis for the comparison of work being carried out in the watertank at Cambridge University.

The aerofoil used was the one of symmetrical section known as R.A.F.30, and the chord and wind speed were chosen so as to give the same Reynolds number $1{\cdot}24 \times 10^5$ and the same tunnel constriction as the apparatus at Cambridge.

The circulation has been determined around a contour enclosing the aerofoil and for the purpose of checking the result, the pressure distribution around the median section of the model was determined by the usual method of inserting a piece of soft metal tubing in the surface of the aerofoil and taking readings on a tilting manometer of the pressures at a number of holes pierced through it. The lift coefficient was then determined by the integration of the pressure distribution diagram, giving a value of 0·359, or about 2 per cent. more than that determined by the circulation.

VARIABLE DENSITY WIND TUNNEL TEST DATA ON MODELS OF THE HAWKER HORNBILL AEROPLANE AND THE AD-1 AEROFOIL SECTION. By W. S. Diehl and R. F. Anderson. Copy of a Report communicated by the National Advisory Committee for Aeronautics. R. & M. No. 1357. (Ae. 488.) (9 pages and 11 diagrams.) June, 1930. Price 1*s.* net.

At the request of the British Aeronautical Research Committee, the National Advisory Committee for Aeronautics, U.S.A., agreed to conduct routine tests in the variable Density Tunnel on a model of the Hawker Hornbill aeroplane and a model of the AD-1 wing section used on the Hornbill. The purpose of these tests was to supply data for use in the study of the unusual high angle stability and control observed in flight tests of this aeroplane. The flight tests were made with and without slots and their effect on the control was found to be extremely small. It was observed that the stability at the stall, without slots, was similar to many aeroplanes with automatic slots. This stability was attributed to the AD-1 aerofoil and further investigation of its properties was suggested.

The Variable Density Wind Tunnel tests show that the AD-1 lies in the class of aerofoils having a low maximum lift coefficient and a flattened lift curve peak. Scale effect on the AD-1 and Hornbill models was similar and was favourable for both lift and drag. The wind tunnel results for lift coefficients near the stall were found to be in good agreement with the flight test data.

CARBURETTOR FUEL METERING CHARACTERISTICS. By W. C. Clothier, M.Sc., Wh.Sch. Communicated by the Director of Scientific Research, Air Ministry. R. & M. No. 1361 (E. 43). (12 pages and 37 diagrams.) December, 1930. Price 9*d.* net.

It has been suggested that the variation in mixture strength caused by change of fuel temperature may be reduced by fitting sharp edged (knife edged) fuel metering orifices to carburettors. In the absence of information as to the magnitude of the change of mixture strength to be expected with the range of temperatures likely to occur in flight, tests on a standard type of carburettor were made to obtain data.

A carburettor (Claudel Hobson type A.V. 48.C) suitable for an 80-h.p. engine was calibrated using 80/20 petrol Benzol mixture at various temperatures, kerosene and white spirit. A constant inlet air temperature was maintained throughout the test to reduce variation due to change of air density. The coefficients of discharge for the various orifices were determined over a range of conditions from flow tests apart from the carburettor.

At full throttle the carburettor as supplied showed very little change of mixture strength with fuel temperature from + 20° C. to — 30° C. over an air flow range such as is likely to occur in service. At part throttle there was considerable weakening with decreased temperature. Over a larger temperature range + 20° C. to — 50° C. weakening of the mixture strength with temperature occurred, especially at the low air flows and at part throttle. When fitted with sharp-edged orifices the mixture became rich with decreased temperature, the increased mixture strength being greater than the variation given by the original jet at full throttle, but less at part throttle.

Flow tests of jets (not fitted to the carburettor) with various shaped orifices showed that sharp edged orifices have constant discharge coefficients over a large temperature range, and consequently give rich mixtures at low temperatures due to the increased density.

PRIVATE FLYING & CLUB NEWS

BROXBOURNE

THE Herts and Essex Aeroplane Club was officially opened on Sunday last, June 14, at the Broxbourne Aerodrome, Nazeing, Essex. This new club has recently been formed, largely as a result of the enthusiasm of the Frogley brothers, well-known dirt-track riders. Three Frogleys are on the board of directors of the club, G. W., A. R., and Roger. The chairman of the board is Mr. F. E. Mockford, who is also well known in dirt-track circles, and the remaining directors are Mr. G. L. A. French and Mr. F. E. Darlow. The chief instructor of the flying school is Mr. W. R. Bannister, R.A.F.O., and at present the club has two Cirrus-Moths in use, G-EBVK and G-EBWT.

The Broxbourne aerodrome is situated about one mile east of Broxbourne and Hoddesdon station and some 5 miles north-west of Epping. Its length is ample in the prevailing wind direction, *i.e.*, south-west, but the width is a good deal smaller, and, when the wind is south or east of south, some care is needed to avoid overshooting. For an experienced pilot there is no difficulty in landing, but pupils may prefer to await a south-west wind before attempting solos.

A nice little club-house, with lounge, office, etc., has been built adjoining the road, and towards the eastern side are the lock-ups for the machines, and the B.P. petrol pump.

On Sunday last the weather was anything but promising in the morning, with grey sky, a threat of rain, and very poor visibility. This fact doubtless accounts largely for the failure of several expected machines to arrive. Nevertheless, during the afternoon something like 15 aeroplanes of various types were to be seen on or over Broxbourne aerodrome. The proceedings were due to have started at 3 p.m., and by that time several thousands of people had arrived and were distributed in the various enclosures. The car park was doing an excellent business, and altogether it looked as if the club's exchequer would benefit considerably from the display which had been organised. Owing to the fact that Miss Amy Johnson was a little late, the actual opening ceremony was postponed, and the fly-past took place as the first item. Mr. Jones, of the Brooklands School of Flying, made a very excellent announcer, and explained the points of each machine as it flew past the enclosures.

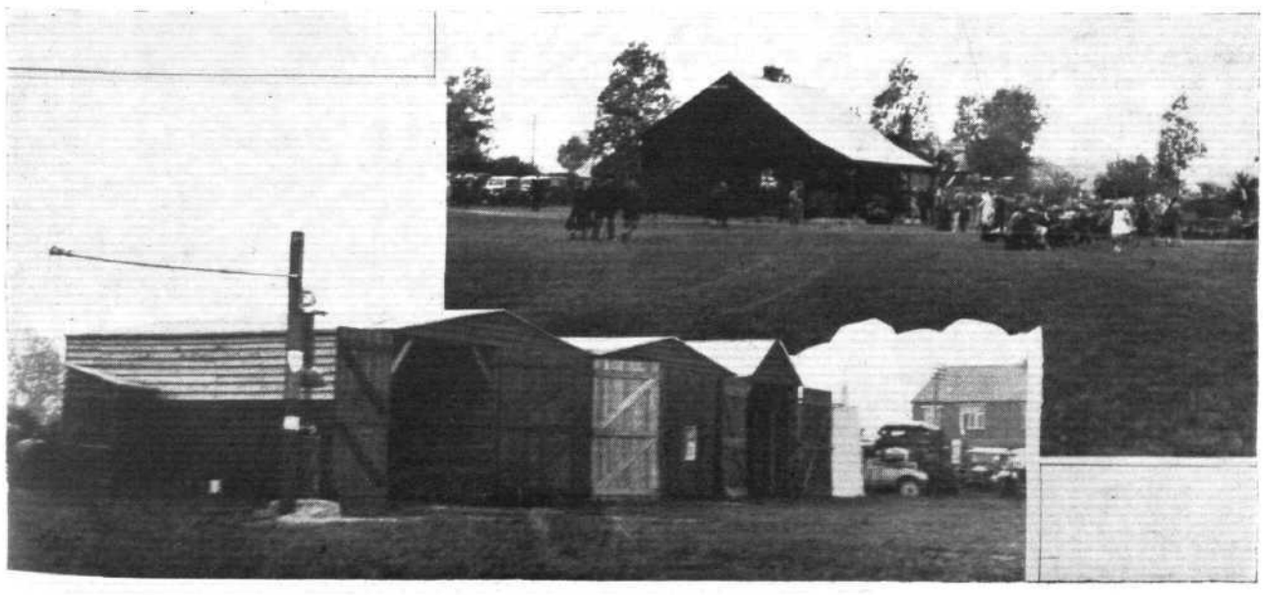
A parachute descent was the next item, L/AC. Fairlie, of Hendon, making a very good jump with a Russell Lobe parachute, which was very steady in the strong gusty wind. Then Miss Johnson arrived in "Jason III," and was duly paraded along the enclosures.

DIRT TRACK RIDERS TAKE TO THE AIR: Roger Frogley (in cockpit) and "Buster" Frogley are among the directors of the Herts and Essex Aeroplane Club which was opened last Sunday.

The official opening ceremony then took place. Mr. F. E. Mockford outlined in a brief speech the aims and objects of the Herts and Essex Aeroplane Club, and mentioned that already the club has more than 40 flying members. The charges made for tuition are £2 per hour for dual instruction and 25s. per hour for solo. Miss Amy Johnson then made a short speech, and declared the club open. Mr. Will Hay, the well-known "schoolmaster," caused much merriment by his references to the location of the club "on the way to Cambridge," and afterwards he cut the christening cake, which had been presented to the club by Mrs. S. Walsham, of Broxbourne. A souvenir in the form of a monoplane containing a petrol lighter was then presented to Miss Johnson, and the display proceeded.

The "turns" were somewhat interfered with by the strong and very gusty wind, which changed direction quite suddenly, and increased in force to an extent which kept Mr. Jeffs busy getting his helpers to swing all the aircraft around facing into the new wind direction. For a moment or two it looked like the wind winning the race, but in the end Mr. Jeffs triumphed, and not a single machine was blown over.

Mr. Lowdell, of the Brooklands School of Flying, enter-



THE HERTS AND ESSEX AEROPLANE CLUB, BROXBOURNE: Above, a view of the Club House, and below, the lock-ups and petrol pump.

tained the crowds during the afternoon, first by "stealing" a machine and flying off on it, committing all the gaucheries which a beginner is said to be subject to, and later by an exhibition of aerobatics.

Mr. Buckingham demonstrated the slow-flying qualities of the Puss Moth, and Mr. Russell did the same on one of the Redwings. The brothers Frogley "bombed" a motor-car, Roger winning by scoring a hit right in the roof of the car. He came down to within about two feet of the car to do it, so it was just as well that the bomb was loaded with flour.

In the late afternoon a Desoutter monoplane came over, and it and the Moths were kept busy for the rest of the afternoon doing joy-riding. Even so, it would have taken a "Hannibal" to have coped with the demand.

Altogether, the meeting was quite a success, and the flying community will wish the Herts and Essex Aeroplane Club all the best in the future.

PHILLIPS & POWIS AIRCRAFT.—Several records were broken during the last month's flying. The second week of May produced a record in the total hours' flying, when 66 hr. 25 min. were put in. The month's flying totalled 260 hr., which is a distinct improvement on the 203 hr. 15 min. of last year. Another record was registered when the dual time was raised to 165 hr. 35 min. as compared with 129 hr. 25 min. of last year. Of the total flying for last month the instructors put in 192 hr. 20 min., and there was little less than one hour's flying difference between them, so that it may truly be said that in every way day by day the School gets better and better. The solo time totalled 61 hr. 35 min. as compared with 23 hr. 5 min. of last year, whilst in the free flying columns as against 21 hr. 5 min. of last year, this non-productive flying total has been reduced to 6 hr. 15 min.

Amongst new pupils registered during the month is Mrs. Stocks, that pioneer airwoman who flew so incredibly long ago as in 1911 or 1912, and has not flown since she was crashed by Sydney Pickles at Hendon in 1913. She has, however, decided to take up flying again, and when up the other day she certainly gave the impression that she had not forgotten very much about the controlling of an aircraft in the air, despite the great difference existing between Moth aircraft and those when she originally took up the game. The School wishes her every success in her pluck and determination to take up flying again. (Hear, hear!—ED.)

A visitor of interest was Major Cotton, in his Bellanca Wright Whirlwind-engined monoplane, which, incidentally, is registered in Italy. Major Cotton had called in with a party consisting of five passengers, amongst whom was his wife. Upon leaving, when at a height of 200 ft., a piston broke, followed by other damage which practically cut his motor dead. With extreme calmness and a brilliant piece of flying, he put his nose down and broke the golden rule of never turning down wind to land, but succeeded in bringing the Bellanca safely down, plus a 20-30 mile wind—pulling up short of the hedge on the leeward end by 20-30 yds. with the aid of his brakes.

SCARBOROUGH AERO CLUB are holding their second Pageant on Saturday, August 15. We hope to publish further particulars of this meeting at a later date.

NORFOLK AND NORWICH AERO CLUB.—The private owners of the Norfolk and Norwich Aero Club, in conjunction with the appropriate Committee of that Club, are very anxious to show their appreciation of the many good times given them by members of various other clubs during the last two years, at such events as fêtes, garden parties, etc., and also for the many minor services rendered to individual flying members when on cross-country flights.

Therefore, the Club has issued the following invitation to all private owners and members of other clubs:—

"On Saturday, July 4, we want all of you to arrive at Mousehold Aerodrome round about 4 p.m., partake of a spot of tea in the Club House, then park your machines for the night in the Club hangars; thereafter, you will be transported in transport of ample proportions to your hotel in the old City of Norwich, whereafter upon completing your ablutions you will be wafted via the cocktail bar to an excellent dinner at a place calculated to please the most fastidious; this, plus entertainment of modest nature will allow us to get you all back to your hotel by 1 a.m. in the morning, whence you will sleep peacefully until the arrival of further transport at 10.30 a.m. Sunday. So to the aerodrome, following a refresher, we all fly to Pat Cubitt's farm beside the sea (a lovely farm it is, too); here, those that will, can bathe to their heart's content, and at 1 p.m. a dainty picnic lunch on the beach in accompaniment with a drop of Mr. Barclay's Lager will sure to please you all. Back to Norwich for tea, and then you can all clear off as and when you like."

R.S.V.P. to Fred Gough, Meadow Creek, Drayton, Norwich. By the way, please note that the Club's Display at Great Yarmouth will be held on September 5, instead of August 29.

CINQUE PORTS FLYING CLUB.—The total flying for the week ending June 13 was 10 hr. 50 min. The weather seriously interfered with flying on Sunday, Wednesday, Thursday and Saturday of this week, which accounts for the very low hours.

The postponed Ashwell-Cooke Cup Competition for June was duly flown off on Sunday, 14th instant, in very bad weather. A wind gusting from 5 to 35 m.p.h. made judging approaches exceedingly tricky, and only four competitors turned out. The winner was Mr. C. Hossle, of Sandgate, who tied for first place in the May Competition, but was beaten on the subsequent fly-off. Mr. Hossle made the excellent gross score of 87; the full results are as follow:—

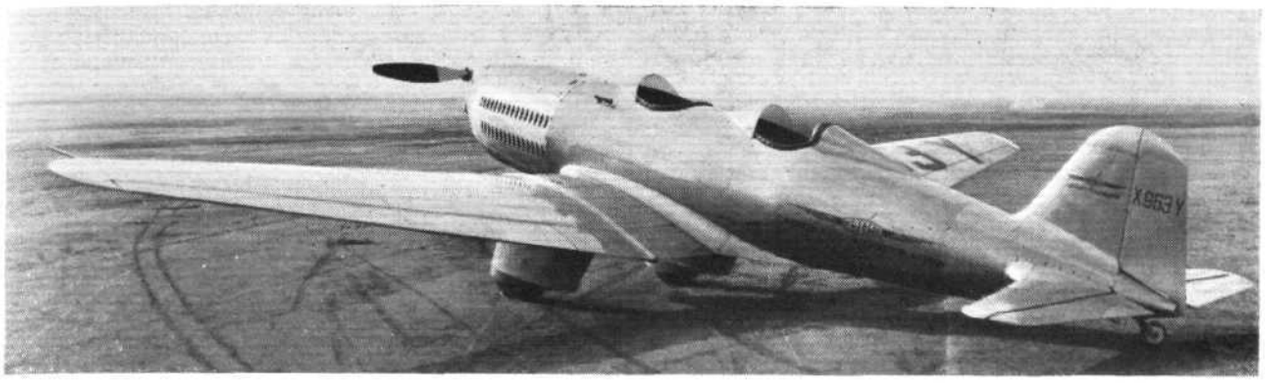
1. C. Hossle, (gross) 87, (handicap) 82; 2. R. E. Nightingale, (gross) 81, (handicap) 76; 3. Mrs. Hammond-Davies, disqualified for undershooting; 4. R. A. Shadforth, disqualified for undershooting.

The final winner of the "Tatler" Scholarship Scheme was Mr. A. J. S. Morris, of Cranbrook, who was picked as being far the best of the six pupils who were chosen from the original fifty applications. These six pupils were classified in the following order of merit at the conclusion of their tests:—(1) Mr. A. J. S. Morris; (2) Mr. C. A. Bettles, of Herne Bay; (3) Mr. A. J. Drake, of Hythe; (4) Mrs. Gubbins, of Barham, near Canterbury; (5) Mr. C. L. Archdale, of the 1st Batt. Manchester Regiment, Shorncliffe; and (6) Mr. H. F. Nalson, of Ramsgate.

LEICESTERSHIRE AERO CLUB.—The following results of the Height Competition, held at Desford on June 6-7, will be of interest.

The competitor was in the front seat of the machine, and the official observer was in the rear cockpit with a stop-watch, when the time of the competitor was taken from his taking-off until he reached an altitude of 4,000 ft. He then climbed a few feet more and then started to glide down. As he passed the 4,000 ft. mark, the stop-watch was again started by the official observer, and the time

FRANCO-BRITISH COUSINS: The French (Morane) and British "Moths" photographed side by side at the recent Orly Meeting.



AN INTERESTING AMERICAN LIGHT PLANE: The Northrop Beta is fitted with a Menasco Buccaneer inverted engine of 160 h.p., with which engine it is expected the machine will have a top speed of 175 m.p.h. The machine is of all metal construction, with stressed-skin wing covering.

taken until the competitor reached the aerodrome, or if short, until he used the engine.

The time taken for the glide down was subtracted from the time taken for the climb.

The competitor with the smallest resulting figure was the winner, who was Mr. P. S. Clifford, with a difference of 1 min. 45 4/5 sec.

The fastest clim was by Mr. C. H. Briggs, in 7 min. 28 1/5 sec., and the slowest glide by Mr. H. P. Lavender, in 5 min. 58 4/5 sec. The full results were:

	Name.	Time Up.	Time Down.	Difference.
		M. S.	M. S.	M. S.
1	P. S. Clifford	7 32	5 46½	1 45½
2	H. R. W. Ellison ..	7 35	5 43½	1 51½
3	H. W. Bott	7 58⅗	5 57⅗	2 1
4	C. H. Briggs	7 28⅕	5 23⅕	2 4⅗
5	C. H. Holyoake ..	8 3	5 57	2 6
6	H. C. C. Macleod ..	7 57⅖	5 47⅖	2 10
7	R. W. Harker	7 57⅗	5 45	2 12⅗
8	J. Cobb	8 0⅗	5 48	2 12⅗
9	W. D. Macpherson ..	8 7⅘	5 54⅘	2 13
10	H. H. L. Ellison ..	7 33⅘	5 11⅕	2 22⅗
11	H. P. Lavender ..	8 23	5 48⅘	2 24⅕
12	T. Warren	7 51	5 23⅕	2 27⅘
13	E. C. Kendall	8 17⅗	5 34	2 43⅗
14	E. Batchelor	7 47⅗	5 2	2 45⅗
15	Miss P. Dawkins ..	8 35⅗	5 49⅕	2 46⅕
16	R. C. Johnson	8 9⅗	5 8⅗	3 0⅘
17	C. E. Hurst	9 7⅘	5 40	3 27⅘
18	S. P. Symington ..	8 46	5 15	3 31
19	J. T. L. Baxter ..	9 27⅖	5 38	3 49⅗
20	T. T. Sawday	10 14⅗	5 49⅖	4 21⅕
21	R. H. S. Brown ..	9 44	4 10	5 34
22	S. Brown	10 45⅗	4 49⅘	5 55⅗

On Saturday and Sunday, June 13 and 14, the Club held an At Home at Desford. It was a very enjoyable affair, and a number of visitors "dropped" in to take part in the festivities.

RAMSGATE AIR RALLY.—The Ramsgate Chamber of Commerce announces that it is intended to hold, on Saturday, July 18, an Air Rally at the aerodrome of the Thanet Aviation Company, which has been licensed by the Air Ministry. It is hoped to make the chief event of the Rally an air race around the Isle of Thanet, and, all being well, this race is likely to become an annual event. This is the first attempt to further the cause of private flying in Thanet, and the organisers are hoping that it will lay the foundation for a lasting interest. Details of the programme will be published later. In the meantime anyone interested is advised to write to the Hon. Secretary, Mr. Harold E. White, at Popular Hotel, Harbour Parade, Ramsgate.

LINCOLNSHIRE AERO CLUB.—The Air Pageant which was to have been held at Cleethorpes on June 6 had, as reported last week, to be cancelled on account of bad weather conditions. The committee has now decided to hold the Pageant on Saturday, July 18, instead.

THE CAMBRIDGE MEETING.—But for the unfortunate accident which cost Mr. George Murray his life, the May Week Meeting held at Fen Ditton by Marshall's School, Cambridge, on June 13, would have been a great success. A race between Oxford and Cambridge machines was won by Mr. Edwards, the well-known Oxford Blue. This was not, as stated in many papers, the first air race between the light and dark blue colours, one having taken place at Hendon many years ago.

The cause of the accident to Mr. Murray appears to have been structural failure. Mr. Murray was flying the Hermes-Avian belonging to the Cirrus Hermes Engineering Co., Ltd., and was diving to gain speed for an upward manœuvre. On the dive the wings broke, the lower one first it seemed, and the machine crashed to the ground before Mr. Murray could make any use of his parachute. He was rushed to hospital, but died shortly after being admitted. The rest of the programme was cancelled.

GLIDING

SOUTHDOWN SKYSAILING CLUB.—Weather conditions on Sunday, June 7, made flying impossible, but several members met at the Club Workshops, and carried out valuable work on the new machine, which is rapidly nearing completion. The machine is now ready for fitting the fabric and doping, and it is hoped to be able to test it in the air within the next two weeks. As this machine has been designed and built entirely by members of the Club, the results of the tests are anxiously awaited.

On Friday last, the Club was honoured to have with them Mlle. Lippens (a Charter Member), complete with "Professor." Early in the morning the wind was northerly and ideal for an endurance flight, but, unfortunately, before getting ready to take off, it had veered to nearly due east. This is one of the worst wind directions for the Ditchling site, but, in spite of this handicap, Mlle. Lippens made a very fine flight of over 20 minutes, and was forced to land owing to the wind temporarily dropping to almost a complete calm. In view of the existing conditions, the performance was considered decidedly good. The flight was carried out on a portion of ground not previously used for gliding or soaring.

It is proposed to carry out flying on Wednesday evenings in future, as well as on Sundays. Members please note!

OVER BERLIN in a Glider.—Some further interesting details are to hand of the soaring flight over Berlin by Otto Fuchs on January 1 and 2, to which we referred recently. It recalls the recent flight over New York by the Stuttgart glider pilot Hirth, although the conditions were somewhat different. Fuchs had his glider towed up to a height of a half-mile, and then cast loose. Although

sailing over flat land, without the "up-wind" created by hills and forests, Fuchs increased his altitude by another eighth of a mile, and soared over the city for about an hour. Then he turned eastwards and flew, also over flat country, to Frankfort-on-the-Oder, a distance of nearly 55 miles, with an average speed of some 40 miles an hour.

The flight, however, was not planned to establish a record in competition with Hirth, but had merely a scientific purpose.

"The Darmstadt gliders came to Berlin with the sole aim of measuring air currents in the lowlands," said Fuchs. "We are not trying to establish any records. If I have an opportunity to carry out long-distance flights, I shall take advantage of it, but not for the sake of creating any records, but because the longer I can remain up, the more measurements of air currents can be made and more experience can be gained. From the technical side, Hirth's flight over New York cannot be compared with mine, since he sailed with the wind over the Hudson River, while in my flight over Berlin I took advantage merely of the air currents due to the different temperatures of the various air strata."

PORTSMOUTH AND SOUTHSEA GLIDING CLUB had a very enjoyable week-end last Whitsun, when the weather was at its best, and some good times were made by members. Mr. Lympany obtained for the club its first "B" certificate with a very fine glide of 80½ sec., including the turns. Another member, Mr. Allen, made a time of 1 min. and 33½ sec., but failed to make the necessary turns. Mr. Robinson made his second qualifying flight of 55 sec. All these obtained a height of about 60 ft. above the crest of the hill at the commencement, and were helped considerably by this to make the times they did. These members are all *ab initio* pilots, and one has not even been in an aeroplane yet, and the times are considered to be quite good under the circumstances.

A considerable number of ground and hill flights were made, with good results, but on Monday afternoon one of the members unfortunately stalled the machine and damaged the fuselage—the first crash for many months now—which prevented any flying on the following week-end. Will anybody desiring information about the Club please write to the Asst. Hon. Secretary, 14, Middle Street, Portsmouth.

THE DAILY MAIL is offering a prize of £1,000 for the first double glide across the English Channel. This sum will be awarded to the sailplane pilot who first succeeds in gliding from France to England, and, after landing, back to France in the same day. Should he fail to make the double journey, then he will receive a prize of £500 for the flight from France. The competition is open from June 20 to October 20, and already a number of entries have been received, including Herr Kronfeld, Mr. Lowe-Wylde, Mr. Lissant Beardmore, R.F.D. Co., E. D. Abbotts, Ltd., London Gliding Club, and probably some French pilots.

BRITISH GLIDING CLUBS

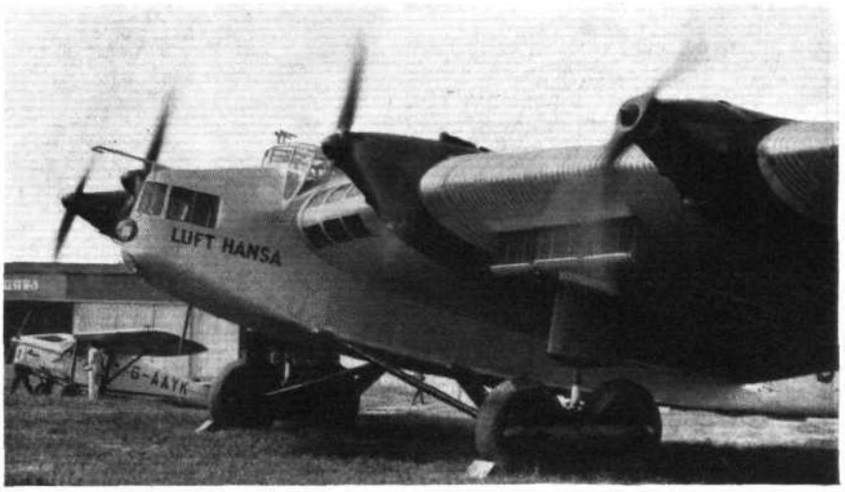
Abergavenny and District Gliding Club.—Sec., "Trossachs," Park Crescent, Abergavenny.
Accrington Gliding Club.—Sec., 62, Queen's Road, Accrington.
Aircraft Club, Harrogate.—Sec., The White House, Starbeck, Harrogate.
Banbury Gliding Club.—Sec., Tadmorton Lodge, Banbury.
Barnoldswick Gliding Club.—Sec., 49, Church Street, Barnoldswick, Yorks.
Barnsley Gliding Club.—Sec., 20, Rowland Road, Barnsley.
Bedford Gliding Club.—Sec., 5, Beresford Road, Bedford.
Birmingham Gliding Club.—Sec., 105, Hunters Road, Handsworth, Birmingham.
Blackpool and Fylde Gliding Club.—Sec., Cross Roads Garage, Thornton, Cleveleys.
Blaenavon Gliding Club.—Sec., Workman's Hall, Blaenavon, Monmouthshire.
Bolton Gliding Club.—Sec., 7, Bute Street, Bolton.
Border Gliding Club.—Sec., Ravensheugh, Selkirk.
Bradford Gliding Club.—3, Briarwood Avenue, Wibsey, Bradford.
Bridlington Gliding Club.—Sec., Crescent Court, Esplanade, Bridlington.
Bristol Gliding Club.—Sec., 14, Woodstock Road, Redland Green, Bristol.
Cardiff Gliding Club.—Sec., 59, Queen Street, Cardiff.
Channel Gliding Club.—Sec., 42, Rendezvous Street, Folkestone.
Comrie Gliding Club.—Sec., Lawers, Comrie, Perthshire.
Cononley Gliding Club.—Sec., 175, Skipton Road, Keighley.
Coventry Gliding Club.—Sec., Llangstone, Job's Lane, Coventry.
Dalkeith Gliding Club.—Sec., Elmfield Works, Dalkeith.
Derby and District Gliding Club.—Sec., "Beachwood," Snelstone, nr. Cubley, Derbyshire.
Doncaster Gliding Club.—Sec., 88, Alfred Road, Askern, Doncaster.
Dorset Gliding Club.—Sec., King's Arms Hotel, Montacute, Somerset.
Dover Gliding Club.—Sec., 106, High Street, Dover.
Dover Sailplane Club.—Sec., 24, East Cliff, Dover.
Driffield and District Gliding Club.—Sec., York Road Corner, Driffield.
Dumfries and District Gliding Club.—Sec., "Oaklea," Glebe Street, Dumfries.
East Grinstead Gliding Club.—Sec., Oakdene, Sackville Lane, East Grinstead.
Eastbourne Gliding Club.—Sec., 81, South Street, Eastbourne.
Edinburgh Gliding Club.—Sec., 16, Bernard Street, Leith.
Egham Gliding Club.—Sec., 46, Wendover Road, Egham, Surrey.
Elgin Gliding Club.—Sec., 71, Smith Street, Elgin.
Essex Gliding Club.—Sec., 113, Coombes Road, Dagenham, Essex.
Eversley Gliding Club.—Sec., Crown Hotel, Eversley, near Todworth.
Exeter Gliding Club.—Sec., c/o Reid and Lee, New North Road, Exeter.
Falkirk and District Gliding Club.—Sec., 122, High Street, Falkirk.
Furness Gliding Club.—Sec., 31, Church Street, Barrow-in-Furness.
Glasgow Gliding Club.—Sec., 70, Exeter Drive, Glasgow.
Grosvenor Gliding Club.—Sec., Horsley House, Commercial Street, Crook, Durham.
Halifax Gliding Club.—Sec., Skircoat Green, Halifax.
Herts and Essex Gliding Club.—Sec., 110, Dunmow Road, Bishop's Stortford.
Huddersfield Gliding Club.—Sec., Bromley Road, Birkby, Huddersfield.
Hull Gliding Club.—Sec., 288, Cottingham Road, Hull.
Hungerford Gliding Club.—Sec., Hidden Cottage, Hungerford, Berks.
Ilkley and District Gliding Club.—Sec., Red Lion Hotel, South Stanley, near Harrogate.
Imperial College Gliding Club.—Sec., Imperial College Union, South Kensington.
Isle of Thanet Gliding Club.—Sec., 17, Chapel Place, Ramsgate.
Isle of Wight Gliding Club.—Sec., 61, Swanmore Road, Ryde, Isle of Wight.
Jersey Gliding Club.—Sec., Meadow Bank, St. Lawrence, Jersey, C.I.
Kent Gliding Club.—Sec., c/o Allnutt and Sons, Paper Mills, Maidstone.
Kilmarnock Gliding Club.—Sec., 7, Low Glencairn Street, Kilmarnock.
Ladybank Gliding Club.—Sec., Woodside, Ladybank, Fife.
Leeds Gliding Club.—Sec., 33, Alexander Avenue, Templebewsome, Leeds.
Lincoln Gliding Club.—Sec., The Manor House, Cherry Willingham, Lincoln.
Littleborough Gliding Club.—Sec., Oakdale, Deanley, Littleborough.
Littlehampton Gliding Club.—Sec., 17, New Road, Littlehampton.
Llandudno Gliding Club.—Sec., Craigydon, Llandudno.
London Gliding Club.—Sec., Empire House, St. Martin's-le-Grand, E.C.
Loughborough Gliding Club.—Sec., Hoton, near Loughborough.
Southern Soarers' Club.—Sec., 4, Montpelier Road, Brighton.
South Essex Gliding Club.—Sec., 41, Hall Road, Chadwell Heath.
South Shropshire and North Hertfordshire Gliding Club.—Sec., Bull Ring, Ludlow.
St. Helens Gliding Club.—Sec., 62, Liverpool Road, St. Helens, Lancs.
Stirling Gliding Club.—Sec., Blairlogie Park, Blairlogie, Stirling.
Stockport Gliding Club.—The Radio House, Sandy Lane, Stockport.
Suffolk and Eastern Counties Gliding Club.—Sec., The Aerodrome, Ipswich.
Sunderland Gliding Club.—Sec., 36, Middle Street, Sunderland.
Surrey Gliding Club.—Sec., 24, Woodbridge Hill Gardens, Guildford.
Taunton and West Somerset Gliding Club.—Sec., c/o Taunton Motor Co., Taunton.
Ulster Gliding Club.—Sec., 376, Upper Beersbridge Road, Belfast.
Warwick Gliding Club.—Sec., School House, Wellesbourne, Warwick.
Westmorland Gliding Club.—Sec., Southfields, Kendal.
Whitehaven Gliding Club.—Sec., "Summerfield," 4, Hensingham Road, Whitehaven.
Wiltshire Gliding Club.—Sec., 8, Savernake Street, Swindon.
Wolseley Gliding Club.—Sec., Wolseley Motors, Ltd., Ward End, Birmingham.
Worcester Gliding Club.—Sec., 48, Malvern Road, St. Johns, Worcester.
Worthing and District Gliding Club.—Sec., 101, Rowlands Road, Worthing.
Wrexham and District Gliding Club.—Sec., Warings Service Garage, Bradley Road, Wrexham.
Malton Gliding Club.—Sec., Welburn, Yorks.
Manchester Gliding Club.—Sec., 64, Osborne Road, West Point, Levenshulme, Manchester.
Matlock Gliding Club.—Sec., Dean Hill Villas, Matlock.
Merthyr and District Gliding Club.—Sec., Inglenook, The Walk, Merthyr Tydfil.
Midland Gliding Club.—Sec., 102, Tettenhall Road, Wolverhampton.
Newcastle Mechanical Club.—27, Philliphaugh, Wallsend-on-Tyne.
Norfolk and Norwich Gliding Club.—Sec., The Aerodrome, Norwich.
North Cotswold Gliding Club.—Sec., Hendon House, 77, Northwick Road, Evesham, Wors.
North Kent Gliding Club.—Sec., Templesheen, Willington, Kent.
North Lindsay Gliding Club.—Sec., 3, Wells Street, Scunthorpe.
North Staffordshire Gliding Club.—Sec., 3, Havelock Place, Shelton, Stoke-on-Trent.
Nottingham Gliding Club.—Sec., 117, Hilton Road, Mapperley, Notts.
Oxford County Gliding Club.—Sec., 11, Frenchey Road, Oxford.
Pilning Gliding Club.—Sec., New Passage Hotel, Pilning, Glos.
Plymouth Gliding Club.—Sec., 6, Tavy Terrace, Burator, Saltash.
Portsmouth and Southsea Gliding Club.—Sec., 9, King's Terrace, Southsea.
Preston and District Gliding Club.—Sec., "Lendor," Lawrence Road, Penwortham Hill, Preston.
Rainford Gliding Club.—Sec., "Calderbrook," Rainford, Lancs.
Richmond (Yorks) Gliding Club.—Sec., West End Garage, Richmond, Yorks.
Rochdale Gliding Club.—Sec., 52, Clovell Street, Morland, Rochdale.
Rugby Gliding Club.—Sec., Birdingham, near Rugby.
Sailplane Club of T.M.A.C.—Sec., 2, Wine Office Court, Fleet Street, E.C.
Salisbury Gliding Club.—Sec., School of Army Co-operation, Old Sarum, Salisbury.
Scarborough Gliding Club.—Sec., Royal Hotel, Scarborough.
Sealand Gliding Club.—Sec., R.A.F., Sealand, Cheshire.
Selby Gliding Club.—Sec., 1, Thorpe Road, Selby.
Sheffield Gliding Club.—Sec., c/o Cole Bros., Library, Fargate, Sheffield.
Southampton Gliding Club.—Sec., 441, Winchester Road, Bassett.
Southdown Skysailing Club.—Sec., Grand Hotel, Brighton.
Southend Gliding Club.—Sec., 43, Northview Drive, Westcliff-on-Sea.

AIR TRANSPORT

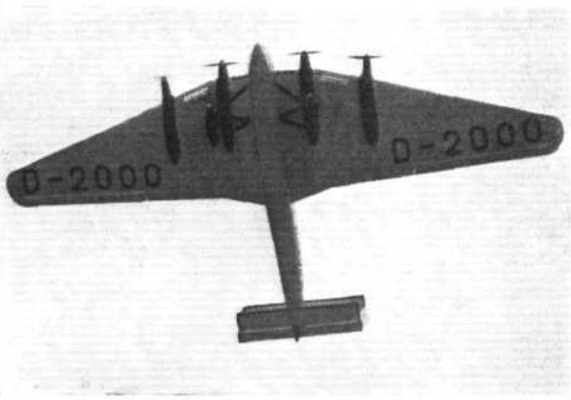
D.2000

JUNKERS G.38 VISITS CROYDON

FRIDAY of last week afforded an excellent opportunity of comparing the *appearance* (if nothing else) of two recent "giant air liners," for on that day the largest German landplane, the Junkers G.38, paid a visit to the London Terminal Aerodrome, while the first of the Handley Page "Hannibals" was being flown by various Imperial Airways pilots. It so happened (we use the word advisedly) that both machines were in the air together, and thus it was possible to get a very good idea of the "styles" of the two types. It is not known what load each machine was carrying at the time, and so one should be wary of making deductions, but by way of recording a general impression it may be said that the "Hannibal" appeared undoubtedly to have the better take-off and climb, while the G.38 seemed to be the faster of the two. The German machine has been given the registration letters D.2000, and one of these days some wag will doubtless paint a letter "A" in front of the "D." The G.38 does certainly rather look like a peep into the future, but possibly opinions may be divided as to whether the "Hannibal" does, as one onlooker on Friday put it, represent a peep into the past.



THE BUSINESS END OF D. 2000: The two inner engines of the Junkers G.38 are Junkers L.88 of 800 h.p. each, while the two other engines are Junkers L.8, of 350 h.p. each. (FLIGHT *Photo.*)



OVERHEAD: This view gives a very good idea of the plan form of the Junkers G.38. (FLIGHT *Photo.*)

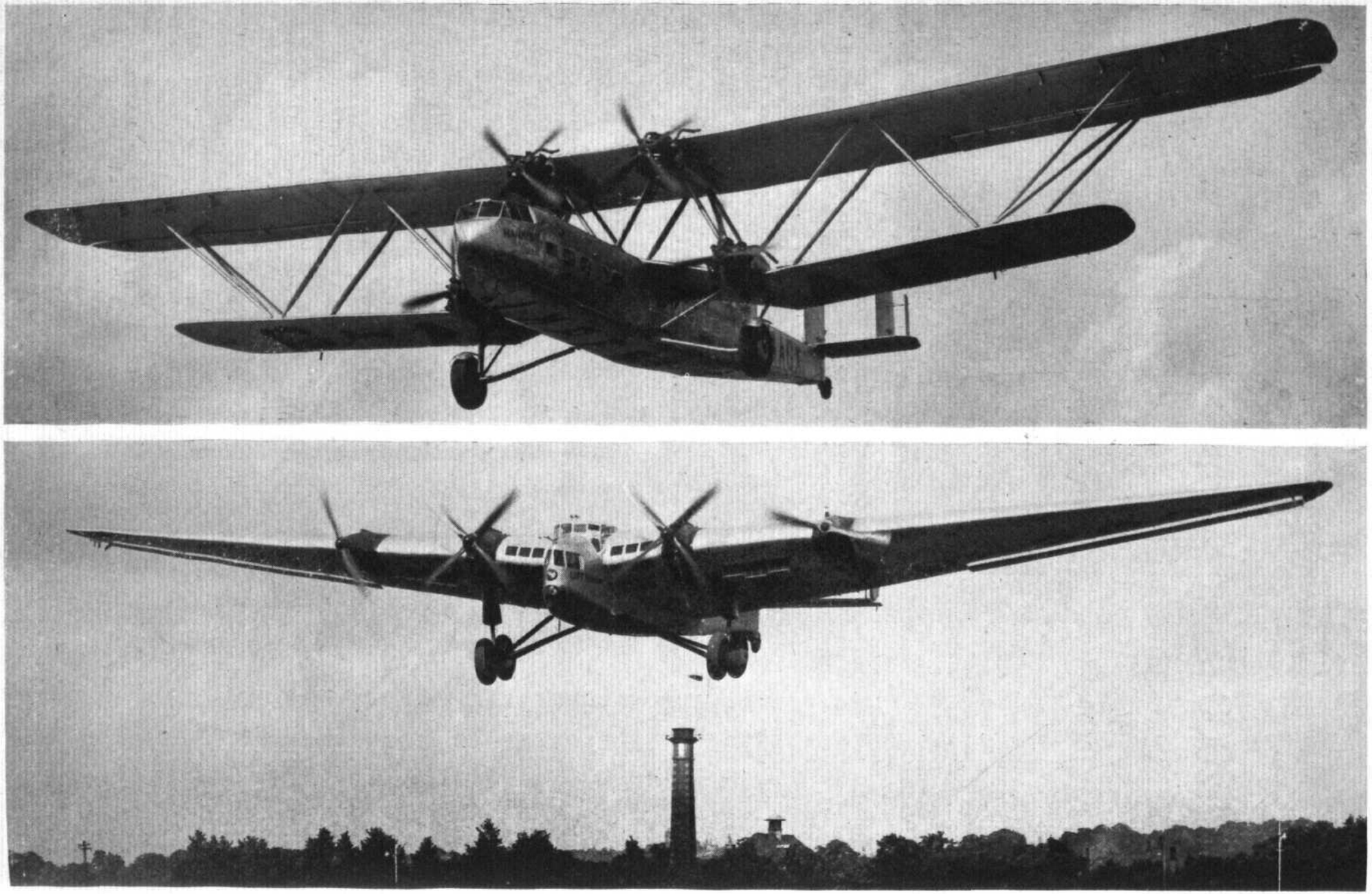
The Junkers G.38 has already been described and illustrated in FLIGHT (see issue of November 29, 1929), while illustrated articles on the "Hannibal" were published in our issues of November 21 and 28, 1930. Thus both types will be known, at any rate in a general way, to readers of FLIGHT.

The Junkers G.38 is a cantilever monoplane of all-metal construction, fitted with four Junkers engines, of which the two engines nearest the fuselage are of the L.88 type, developing 800 h.p. each. The two outboard engines are of the Junkers L.8 type, and develop 350 h.p. each, so that the total normal power of the G.38 is 2,300 h.p. The gross weight of the machine is 21 metric tons (46,200 lb.) and the tare weight is, we are informed, 14½ metric tons (31,900 lb.). The disposable load of the G.38 is thus 14,300 lb. This can, of course, be apportioned in almost any desired ratio between pay load and fuel and oil (or, in other words, range). The ratio gross weight to tare weight is 1.45, which must be regarded as a very good figure indeed for a machine of this type, showing, as it does, that the machine will carry 45 per cent. of its tare weight as disposable load.

The main dimensions of the G.38 are: Length, 23 m. (75 ft. 5 in.); wing span, 45 m. (147 ft. 7 in.); wing area, 290 sq. m. (3,120 sq. ft.). At a gross weight of 46,200 lb. the wing loading is thus 14.8 lb./sq. ft. and the power loading 20.1 lb./h.p. The cruising speed is believed to be about 110 m.p.h.

By way of comparison it may be recalled that the Handley Page "Hannibal" has an overall length of 86 ft. 6 in., a top plane wing span of 130 ft. and a total wing area of 3,000 sq. ft. The gross weight of the "Hannibal" is about 29,500 lb. (this figure refers to the "Western"

NOT DECORATIVE: The biplane tail of the Junkers G.38 does not add to the beauty of the machine, but a large-span monoplane tail behind four engines would probably have had an unhappy time of it. (FLIGHT *Photo.*)



WHICH IS RIGHT? These two views afford an interesting comparison between the Handley Page "Hannibal" (4 Bristol "Jupiters") and the Junkers G.38 (4 Junkers engines). (FLIGHT *Photos.*)

model) and the tare weight 18,555 lb. (also "Western" model). Thus in the "Hannibal" Western model the ratio gross weight to tare weight is 1.59, which is even better than for the Junkers G.38, and corresponds to a disposable load of 59 per cent. of the tare weight as compared with the 45 per cent. of the Junkers. The wing and power loadings of the "Hannibal" are 9.8 lb./sq. ft. and 15 lb./h.p. respectively, both figures considerably lower than those of the G.38. This difference results, of course, from the far greater gross weight of the Junkers (46,200 lb. against 29,500 lb.), while the wing area and total engine power are approximately identical in the two machines.

On Friday last, when both machines passed overhead repeatedly, the Junkers was noticeably the quieter of the two. The water-cooled engines, entirely cowled-in, seemed far less noisy than the air-cooled engines in the "Hannibal." This must be mainly due to exhaust and mechanical engine noises, as the engines of both machines are all of the geared type, so that the propeller noises should be approximately the same in both. The German pilot "threw about" the Junkers considerably, doing very steeply-banked turns, which showed the large machine to be very controllable. The "Hannibal," on the other hand, was handled with respect, due doubtless to the fact that the British pilots have not yet had an opportunity of becoming thoroughly familiar with the machine, which has but recently been delivered to Imperial Airways. Not that there is any point in "throwing about" a large passenger machine in any case, except as part of its acceptance tests before it is put in service.

U.S. Bookings and Imperial Airways

THE Postal Telegraph Company, which has 22,000 offices in the United States, has entered into an agreement with Imperial Airways to act as booking agent in that country for all lines in the Imperial Airways system. This makes it possible to secure a booking in any city of the United States for a passage from London to India or between any other places in the system.

New Channel Islands Air Service

A COMPANY has just been formed for the purpose of maintaining an air service between Guernsey, Jersey and England. This is the fourth such enterprise, including the Imperial Airways service of three years ago with "Calcuttas." The prime movers in the new enterprise are Lord Amherst and Mr. G. Black, of Garroway, Black & Co. With these exceptions the board consists of local business men. It is intended to use Saunders-Roe "Saro-Clouds" for the service. Two machines will be used, one for passengers and one for freight, and it is expected that during the potato season the Guernsey growers will make considerable use of the latter plane in order to place their produce on the markets considerably sooner than is possible by mail boats and train. Flower growers are also expected to benefit. An official of the Guernsey Growers' Association has been appointed to the board.

A Canadian Merger

IT is reported that the Western Canada Airways Ltd. have taken over the assets of the Commercial Airways of Edmonton for a consideration said to be about $150,000, according to the announcement made. The Edmonton organisation included among its assets five cabin airplanes, four Bellancas and a Lockhead-Vega machine, as well as a full complement of hangars, nose-hangars, slip ways, docks and other equipment. The value, however, does not include mail contracts, business worked up or goodwill of the concern.

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AERIAL GEODETIC SURVEY IN CANADA

An Interesting Communication from the High Commissioner for Canada in London

QUITE an amazing record, when compared with the possibilities a few years ago, was made by Mr. J. L. Rannie and Mr. F. P. Steers of the Geodetic Survey of Canada, Department of the Interior, during January and February last. In a period of four weeks they laid out by aeroplane a system of triangulation in northern Ontario, which would have taken several years to accomplish by older methods of transport by canoe and back-packing.

In two Royal Canadian Air Force planes these Geodetic Survey officers selected the sites for triangulation stations in a strip of country about 800 miles long (including branches) and from 15 to 30 miles wide from Sudbury to the north-west end of Lake Nipigon. The branches extended towards Timmins and Nakina on the north and towards Sault Ste. Marie and Port Arthur on the south.

To divide up the area into suitably sized sections, three bases were chosen from which to operate. In the selection of these bases three important considerations had to be borne in mind, viz., the base must be on a lake large enough for aircraft to land and take off, it should be on the railway to facilitate transportation of oil and gasolene for refuelling, and it must be possible to secure board and lodging for the personnel of the party, seven in number. The first two qualifications were not difficult to find, but the third was not so easy.

The aircraft used on the operation were very speedy cabin monoplanes, fitted with skis and carrying equipment to enable them to operate from bases remote from regular aerodromes. By means of bell-shaped nose tents and collapsible wood-burning stoves the engines could be thoroughly warmed before starting, even when extremely low temperatures, such as forty degrees below zero, were experienced. Emergency equipment, consisting of rations, sleeping robes, tent, rifle, snowshoes, axes, etc., was continuously carried in each aircraft. The performance of the planes throughout the whole operation was most satisfactory, thanks largely to the very efficient pilots and crews, who kept the engines and aeroplanes functioning under somewhat unfavourable conditions.

During the past two years experiments have been made by Geodetic Survey officers to test the economy of aeroplane transport on this class of work and to perfect the technical methods by which this faster means of transportation is best adapted to geodetic surveying. The operation, just completed with great economy and speed, marks the commencement on a larger scale of a programme of extension of triangulation operations to the huge northern areas of Canada in which development is proceeding so quickly.

It may be mentioned in passing that large areas of Canada abound in lakes, and that this type of country is particularly suitable to geodetic operations with present types of aeroplanes. With improved types of planes the extension of the method to other areas at present avoided because of the absence of lakes will probably become possible.

Apart from the economy, the use of aeroplanes as a means of transport for laying out a system of triangulation over large areas of Canada years in advance of final operations has other advantages. In parts of the country, such as northern Ontario, where a programme of building steel lookout towers for fire detection is in progress, the triangulation stations offer the best choice of hills as sites for these towers. The towers, when built, and trails and telephone lines installed, are of great assistance when the triangulation is being completed. It is therefore mutually advantageous to forestry and geodetic officials to have the triangulation laid out well in advance of subsequent operations. When the preliminary work of the triangulation has been laid out well ahead of subsequent operations, as is possible when it is done by aeroplane, there need be no delay in completing the final work in any area in which development takes place or where maps are required, and data can be made available on an astronomical datum in plenty of time to be made use of. When the preliminary work has to be done by ground travel in rough country, it is sometimes two years or more before results are available to those requiring the information. With aeroplanes as a means of transport in laying out the triangulation, a year or more is saved in delivering results. Another advantage is that, the triangulation having been laid out with its different grades of accuracy as needed, operations which are required in isolated sections can be completed with the grade of accuracy which will make them fit in with the final net as laid out for the whole country.

AIRPORT NEWS

BROOKLANDS

NOW that the display at Brooklands has been brought to a satisfactory conclusion, serious work and ground routine is the order of the day. The week's weather was bad, but 30 hours' instructional flying were completed, including launching one pupil on his first solo.

The Brooklands Display has evoked comment as to whether these displays are, after all, being run on the right lines. The Brooklands organisation claims that this display was run so as not to boost the pilot unduly at the expense of the machine, since both the programme and the broadcasting were largely devoted to descriptions of the different types, their features and their prices.

None the less, it is a matter of experience that the "public," using the hard-worked word in the sense of the people who are not yet flying enthusiasts, will not turn up at a display unless there is a certain circus element in it.

As a result of the display, Brooklands has 24 new flying club members and six new pupils. As a display is only a means to the end of creating air-mindedness, the management of Brooklands claims that its display has amply justified itself.

The repair department of Brooklands is intent on proving "old aircraft never die," and Captain Stack's four-year-old "Moth" came out this week looking quite as "good as new" with a new red and white colour scheme.

The new sales department is also busy, and is under the direction of Mr. K. E. Parker.

A new feature of each of the School machines is the Thornton Norris Air Log, which registers flying time, and saves the familiar argument between timekeeper and pilot.

The model of the new club house exhibited at the display was widely admired. Workmen have already started on the real thing, and it is scheduled to be ready this season.

CROYDON

THE most interesting event of the week under review was the visit of the Junker's G.38. This machine arrived on Thursday morning and remained until Saturday morning, and during this time many people inspected it, and a privileged few were given flights on the Friday. Hangar space was not available owing to the great span, and it had to remain out on the aerodrome. From an engineering point of view the G.38 is no doubt a masterpiece, and the more one sees of it the more one marvels at the construction. The performance of the machine, however, is not so impressive as "Hannibal." The G.38 seems more sluggish getting off and on the climb. "Hannibal," from the moment the pilot opens up the engines, seems as if it wants to be up in the air, and there is no sluggishness in taking-off or climbing. Whatever jokes we have had at "Hannibal's" expense, we have got to admit that it lacks nothing in performance, and it has taken a number of the sceptics by surprise. It is also, from an airline point of view, in my opinion, a better commercial proposition than the G.38, although we all agree the latter is a wonderful machine.

"Hannibal" had bad luck on Monday in breaking the tail wheel fittings as it was pushed from the hangar, but the trouble was soon remedied, and trips to Paris and back have been made daily with no trouble at all, and it is as fast, if not faster, than any of the other machines now operating to and from Croydon. The quietness of both these giants in the air is very noticeable, and small machines like Moths appear noisy after these two. A full report on these two machines will be found on page 561.

Several honeymoon couples have again used the airways this week, and one suggests that a special honeymoon machine might be placed on service, as the demand seems to be great, judging by the couples that pass through here now.

Personal Flying Service have again placed their Desoutter on service after its argument with the fence at Berck.

We have had an old friend to see us during the week, Major Kenworthy. Many will well remember him piloting the Blackburn Kangaroos from Brough in the early days of civil aviation.

One would like to express the deep regret of many here on hearing of the death of Mr. G. Murray, of Brooklands. He often visited Croydon, and, although a comparatively young pilot, he was admired by many of the old pilots here for his skill at aerobatics. Many at Croydon have never seen him give an exhibition, but it was always a sight worth seeing, and his loss is a blow to aviation, and he will be sorely missed by many friends and by many clubs.

I understand Mr. Will Hay, that well-known variety artiste, has purchased a "Redwing." One wonders when these machines will be seen in their hundreds like Moths, as they are one of the most stable light machines on the market to-day.

With all the efforts of the Air Ministry, the dust nuisance does not seem to have been overcome. It is no doubt a very difficult problem at an aerodrome where there is so much traffic. I doubt whether it can be cured, as, however far out they may extend the tarmac area, there must be an edge, and the wind will still bring the dust on to the tarmac, where the machines will finish the job of choking everyone with it.

The traffic figures for the week were: Passengers, 1,149; freight, 85 tons.

P. B.

AN AERIAL BEACON: This is the "Airway Beacon," manufactured by the London Electric Firm, South Croydon, which is fitted with electric rotating gear, and having an enclosed lantern and lamp holder gear to suit 1000 watt Projector pattern gas-filled lamps—two being carried, and automatic mechanism brings the second lamp into focal position in the event of failure of the first lamp.

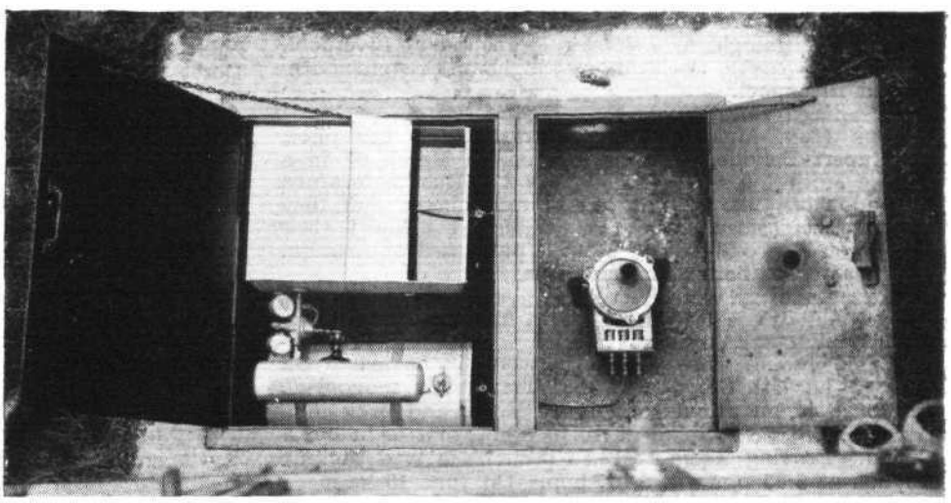
IRISH AERODROMES

ON Monday, June 8, the first civil aerodrome in Ireland was opened at Finglas, a short distance outside Dublin. The aerodrome has an area of approximately 36 acres, but as soon as necessary arrangements have been completed this will be doubled. Iona National Airways, Ltd., the owners and operators of the aerodrome, inaugurated their air taxi and training service at the same time with free "flips" in the Company's machines, three Moths. Flying is at present under the direction of Mr. M. F. Coogan, chief pilot of the School, but it is expected that in the near future he will be called upon to devote all his energies to the training of pupils, it is reported that there are thirty awaiting instruction, including Miss Mercedes Gleitze. Benign officialdom was represented at the opening ceremony by Mr. Seumas Dolan, Parliamentary Secretary to the Department of Industry and Commerce, who was accompanied by Captain H. D. McClenaghan, of the Aviation Department. Discussing the project with a FLIGHT representative, Mr. Dolan said that the Free State fully recognised the importance of civil aviation, but the State, being a comparatively new one, had a number of urgent matters which demanded all the funds which were available at present; but flying would certainly receive attention in the "not too far distant future." Among the many well-wishers at the ceremony were Commandant Carroll, O.C. Army Air Corps, Mr. M. A. Doyle, Chief Aeronautical Engineer, Army Air Corps, members of the Irish Aero Club and numerous representatives of the Civic Guard.

While no official sanction has yet been given for the use of Johnstown Aerodrome, near Wexford, Captain R. Cazalet is reported to have used the aerodrome when flying from England in his Puss Moth G—ABDL; apparently Customs clearance can be obtained from the revenue officers at Wexford. It is understood that the Aviation Department, Ministry for Industry and Commerce, is endeavouring to speed matters up for pilots visiting the Free State during the summer. Iona National Airways, Ltd., Dublin, have made arrangements for the use of fields near Finglas, a few miles north of the city of Dublin, as a base for the flying school and joy-riding operations of the company, which now owns three Moths. Pilots who have inspected the field have expressed favourable opinions on it.

Cardiff Airport

THE Cardiff Finance Committee on June 1 decided to proceed at once with the new aerodrome on the Splottide fields, and to construct a hangar to house five aeroplanes. The city engineer is to be asked to visit some of the latest aerodromes in Europe before deciding upon the general layout. Several thousands of pounds have already been spent in draining the land and erecting a sea wall to protect the site from floods and high tides. This, it appears, is the result of the activity of the promoters of the proposed Cardiff Flying Club, a privately formed company, which undertook to manage the aerodrome, if satisfactory arrangements could be come to with the corporation and the necessary hangars provided, until such time as the corporation might decide to enter into an agreement with a commercial aviation company.



THE AHRENS WIND DIRECTION INDICATOR: In our issue of June 5 we gave brief particulars of this device installed at Hanworth. Here we give a plan view of the apparatus, which is sunk into the ground in the centre of the white landing circle. (FLIGHT *Photo.*)

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MODEL COMPETITIONS

THE following announcements arrived too late for inclusion in our Model Section last week:—

Sir John Shelley Cup.—Saturday, June 20, at Wimbledon Common.

(1) The competition to be an open one. Entrance fee for non-members, 2s. 6d. Members of affiliated clubs, 1s. (under 21, 6d.).

(2) The competition to be for duration of fuselage models (fuselage *must* comply with the Society's formula).

(3) Only mechanical power plants to be used (*not* rubber).

(4) The models must rise off the ground under their own power.

(5) The best of three flights to count.

Prizes: 1st—Winner to hold cup for one year. Silver medal (or prize to value) and 10s. 2nd.—Bronze medal (or material to value). 3rd.—Diploma.

Farrow Shield Inter-Club Contest.—The Model Aircraft Club will fly off for this contest on July 4, at Stag Lane Aerodrome, Edgware, and not at Wimbledon, as originally arranged.

Attention of members is drawn to the revised rules of the S.M.A.E. for this contest, which are given below. It is regretted that owing to an oversight the old rules were given in the previous announcement with regard to this contest.

(1) The Farrow Shield remains the property of the S.M.A.E.

(2) Contests for the Farrow Shield to be held annually, between affiliated Clubs or Societies.

(3) Each Club or Society can enter any number of competitors.

(4) The models to be of fuselage type, and comply with the Society's formula.

(5) All models shall be hand-launched.

(6) The best durations of the three leading models of each club to count. The durations added will give the number of points scored.

(7) Competitors will be allowed three flights each, at the discretion of the judges, and the best one to count.

(8) No competitor may make a test flight during the competition except by permission of the judges.

(9) Affiliated Clubs will hold these trials on their own ground and be timed by timekeepers approved by the Society.

(10) Affiliated Clubs to arrange the date for this contest and to advise the Competition Secretary of the S.M.A.E. at least 14 clear days beforehand.

(11) Affiliated Clubs must send the results of their contest to the Competition Secretary of the S.M.A.E. within seven days of the contest.

Prizes.—The winning Club or Society to hold the Farrow Shield for one year. The winning Club team will receive three silver medals and the runners-up will receive three bronze medals.

AIRISMS FROM THE FOUR WINDS

Prince George to Fly to Cornwall

ON June 24 Prince George will fly in a seaplane from St. Austell to Looe, where he will make a short inspection of the district.

Mr. C. W. A. Scott on Tour

THE KING has sent, through the Secretary of State for Air, a congratulatory message to Mr. C. W. A. Scott on breaking the record by his flight from Australia to England. It will be remembered that His Majesty sent a similar message to Mr. Scott when he reached Australia in record flying time. Mr. Scott has also received the following cablegram from Mr. J. H. Scullin, Prime Minister of Australia: "I desire to convey heartiest congratulations from all Australians upon your great achievement."

On June 13 Mr. Scott started on a tour of England, organised by the *Daily Herald*, in his "Gipsy Moth," accompanied by Mr. Hannen Swaffer. The first town visited was Brighton, and from here the following towns, amongst others, are included in the tour:—Southampton, Southend, Birmingham, Leicester, Manchester, Liverpool, Glasgow, Newcastle, Sheffield, Nottingham, Bristol, Southsea and Blackpool.

Mrs. Montagu Returns

THE HON. MRS. EDWARD MONTAGU and her pilot, Mr. Rupert Belville, who left Heston on March 27 in a "Gipsy Moth" for a tour of Persia and Russia, returned to London on June 15. It will be remembered that they crashed their machine in Persia and continued their journey on a second-hand "Moth" purchased at Amman.

Vicomtesse de Sibour's Eastern Tour

THE VICOMTE AND VICOMTESSE DE SIBOUR left Le Bourget Aerodrome on June 16 for a flight across Asia.

Hawks' High Speed Hops (Hectic)

CAPT. FRANK HAWKS has been at it again! On June 17 he left Croydon in his Travel Air monoplane *Texaco 13* in an attempt to fly to Rome and back in a day. He reached Rome at 10.10 a.m., that is in 4 hr. 39 min. Leaving Rome at 12.55 p.m. he arrived back at Croydon at 5.55 p.m.—a 5 hr. hop. On June 15 he made the flight from Rome to Croydon in a little under 6 hr.

Aeroplanes to protect Irish Fisheries

FOR some considerable time the fisheries around the Irish coasts have been subject to piracy by foreign trawlers who have cast nets well within the three-mile limit and often stolen lobster pots left down by local fishermen. The whole of the coast of the Irish Free State is patrolled by one fisheries protection cruiser, which has proved altogether inadequate; and during a recent debate in the Dail (Parliament) one member, with commendable sense, suggested that aeroplanes, either of the Army Air Corps or purchased specially for the Fisheries Association, should be used for the work of patrolling the territorial waters. The suggestion was well received, but no remarks have been made on the matter, by the Minister concerned, at the time of writing.

Short "Calcuttas" for France

THIS week at the Seaplane Station at Rochester, on the Medway, Capt. Costes, Inspector-General of the Air Union, took delivery of the first of the all-metal British flying boats which have been ordered by the Air Union for their Mediterranean service. These aircraft are three-engined "Calcuttas," seating sixteen passengers in the comfortable hull, and can fly with one engine out of action. They are intended for use on the services between Marseilles and North Africa, thus completing the sea link in the airway which brings Africa within one and a-half days of London. It was in pursuance of the policy of securing the best equipment regardless of cost or nationality, that the French authorities, guided by expert opinion, chose this machine, thus paying a remarkable tribute to the excellence of British aircraft design in the flying boat field. The other "Calcuttas" will be built in France, under licence, by the Breguet Co.

Firefly in Rumania

IN connection with the International Air Rally at Bucharest, and the F.A.I. Congress and other aviation events held in Rumania recently, Fl.-Lieut. Staniland, Fairey's test pilot, has been giving demonstrations of the Fairey Firefly II fitted with Rolls-Royce "Kestrel" engine. We learn that Staniland made the spectators gasp for breath with some of his evolutions, and that altogether authorities, as well as the general public, were vastly impressed by this British single-seater fighter.

Bristol "Bulldogs" for Sweden

THE squadron of Bristol "Bulldog" fighters ordered for the Swedish Air Force have just been delivered, and will be put into service immediately. It may be noted here that these machines had not arrived when the accident happened to a Swedish seaplane recently, and some confusion led to reports that the machine which crashed was a Bristol Jupiter seaplane. Actually it was a seaplane of German construction, fitted with a Jupiter engine.

Death of M. Paillard

M. PAILLARD, the well-known French Ace and former holder of the world's endurance record, died in Paris on June 16 after an operation for appendicitis.

Another New Record

FLYING a Dewoitine monoplane, with 650-h.p. Hispano Suiza engine, the French pilots Capt. Le Brix and Marcel Doret have beaten the long-distance (non-refuelling) record in a closed circuit. They took-off from Istres aerodrome at 4.49 a.m. on June7 and landed at 3 a.m. June 10, having thus remained in the air for 70½ hours, during which time they covered 6,523 miles. The previous record was 5,567 miles, established by the late M. Paillard.

British Air Adviser for Greece

THE British Minister and the Greek Minister for Aviation have just signed an agreement appointing a British officer Aviation Adviser to the Greek Government for one year.

Aeroplane Holds Up Derby Traffic

RAILWAY traffic was held up for nearly an hour on the railway at Epsom Downs on June 3, when an aeroplane, carrying two passengers, made a forced landing on the line. The occupants were only slightly injured.

The Return of the Crinoline ?

ACCORDING to the Weymouth correspondent of the *Daily Telegraph*, a lady visitor walking along the cliffs at Lulworth disappeared over the edge and fell to the water 200 ft. below. Her dress acting as a parachute saved her life!

WINNER OF "FLIGHT" CUP MODEL COMPETITION: Mr. A. T. Willis (T.M.A.C.), who, on June 13 at Wimbledon, won the "Flight" Cup Competition with a flight of 155 secs. He was flying a similar model to that he is seen holding above, which is his parachute-dropping monoplane.

THE ROYAL AIR FORCE

London Gazette, June 9, 1931.

General Duties Branch

The following are granted permanent commns. as Pilot Officers on probation with effect from and with seny. of May 29 :—326111 Sergeant A. J. Pegg, 362730 Sergeant F. L. White, 362870 Sergeant R. Cleland, 361911 Sergeant A. V. Bax.

The following Pilot Officers on probation are confirmed in rank :—C. F. G. Adye (March 26) ; E. Dawson (April 11) ; D. D. Christie (May 19) ; W. C. Sheen (May 19). The following Pilot Officers are promoted to rank of Flying Officer :—M. V. de Satge (Aug. 1, 1930) ; H. E. Mayes (Sept. 15, 1930) substituted for *Gazette* Dec. 23, 1930) ; E. E. Ellison (Oct. 14, 1930) ; H. R. Clay, R. J. Cohen, N. Kirkham, A. N. Luxmoore (April 14) ; P. F. Canning (April 21) ; E. D. Mills (May 7). Flight-Lieut. J. C. Belford takes rank and precedence as if his appointment as Flight-Lieut. bore date Jan. 1, 1930, immediately following Flight-Lieut. J. L. F. Fuller-Good on the gradation list (reduction takes effect from March 28) ; Squadron Leader F. E. Hellyer O.B.E., is placed on retired list (May 1).

Stores Branch

Squadron Leader A. Davidson, M.C., is transferred to Reserve, Class B (May 27).

Accountant Branch

The following are granted permanent commns. as Pilot Officers on probation with effect from and with seny. of June 1 :—W. M. Lyons, F. C. Hayward, C. G. Stowell, T. E. Horsfield, L. Hornabrook, E. Bowman.

Medical Branch

Lt. R. N. Kinnison, M.B., Ch.B.(T.A.R.O.), is granted a short service commn. as Flying Officer for three years on Active List, with effect from and with seny. of May 12. (Substituted for *Gazette*, May 26.)

RESERVE OF AIR FORCE OFFICERS

General Duties Branch

T. C. Wallace is granted a commn. in Class AA (ii) as a Pilot Officer (May 27) ; M. Dawnay is granted a commn. in Special Reserve as Pilot Officer on probation (May 4). The following Pilot Officers of Special Reserve are promoted to rank of Flying Officer :—R. Heathcote (Feb. 22) ; M. M. Hutchinson (Feb. 22) ; C. W. Lindsay (May 8). Flying Officer W. H. Phillips is transferred from Class C to Class A (May 18) ; Flying Officer A. E. Francis relinquishes his commn. on completion of service (May 1).

Medical Branch

Flying Officer S. S. Proctor, M.B., relinquishes his commn. on completion of service (June 17, 1930).

AUXILIARY AIR FORCE

General Duties Branch

No. 600 (CITY OF LONDON) (BOMBER) SQUADRON. P. S. Norris to be Pilot Officer (April 3). No. 601 (COUNTY OF LONDON) (BOMBER) SQUADRON.—R. J. Holland to be Pilot Officer (April 3).

No. 602 (CITY OF GLASGOW) (BOMBER) SQUADRON.—Squadron Leader J. Fullerton resigns his commn. and is permitted to retain his rank (May 6) ; Flight-Lieut. D. Douglas-Hamilton, Marquess of Douglas and Clydesdale, M.P., is promoted to rank of Squadron Leader, to command the squadron (May 6) ; J. H. Hodge to be Pilot Officer (March 30) ; Flying Officer A. D. Farquhar is promoted to rank of Flight-Lieut. (May 6).

ROYAL AIR FORCE INTELLIGENCE

Appointments.—The following appointments in the Royal Air Force are notified :—

General Duties Branch

Group Captain H. le M. Brock, D.S.O., to R.A.F. Depot, Uxbridge, on transfer to Home Estab., 2.5.31.

Wing Commander R. B. Maycock, O.B.E., to R.A.F. Depot, Uxbridge, on transfer to Home Estab., 6.5.31.

Squadron-Leaders : V. R. Scriven, A.F.C., to R.A.F. Depot, Uxbridge, 6.6.31. P. F. Fullard, D.S.O., M.C., A.F.C., to R.A.F. Depot, Uxbridge, 8.5.31.

Flight-Lieutenants : W. J. Daddo-Langlois, R. H. Horniman, A. P. Revington, all to R.A.F. Depot, Uxbridge, 29.4.31. P. Murgatroyd, to R.A.F. Depot, Uxbridge, 20.5.31. O. R. Pigott, to H.Q., R.A.F., Trans-Jordan and Palestine, Jerusalem, 16.5.31. G. E. Nicholetts, A.F.C., to No. 209 Sqdn., Mount Batten, 2.6.31. T. B. Prickman, to No. 500 Sqdn., Manston, 5.6.31. L. G. Maxton, A.F.C., to No. 210 Sqdn., Felixstowe, 1.6.31. G. R. O'Sullivan, to No. 10 Group H.Q., Lee-on-Solent, 30.5.31. E. J. Protheroe, to R.A.F. Depot, Uxbridge, 21.5.31. R. W. G. Lywood, to Station H.Q., Worthy Down, 8.6.31.

Flying Officers : J. A. H. Louden, to H.Q., R.A.F., Halton, 28.5.31. L. F. H. Orr, to Anti-Aircraft Co-operation Flight, Biggin Hill, 27.5.31. R. F. A. W. Williams, to School of Naval Co-operation, Lee-on-Solent, 2.6.31. I. A. Critchley, to No. 602 Sqdn., Glasgow, 1.6.31. C. K. Turner-Hughes, to No. 24 Sqdn., Northolt, 4.6.31. G. F. Overbury, to R.A.F. Depot, Uxbridge, 27.5.31.

Pilot Officers : C. J. Farrell, to Anti-Aircraft Co-operation Flight, Biggin Hill, 24.5.31. L. T. G. Barber, to School of Army Co-operation, Old Sarum, 1.6.31. J. C. F. Peacock, to School of Army Co-operation, Old Sarum, 29.5.31 I. G. Ross, to No. 7 Sqdn., Worthy Down, 25.5.31.

The undermentioned are posted to the units indicated on appointment to permanent commns. with effect from 29.5.31 :—A. V. Bax, A.F.M., to No. 35 Sqdn., Bircham Newton. R. Cleland, to No. 29 Sqdn., North Weald. A. J. Pegg, to No. 22 Sqdn., Martlesham Heath. F. L. White, to No. 15 Sqdn., Martlesham Heath.

Stores Branch

Squadron-Leaders : V. J. B. Jacobs, to Marine Aircraft Experimental Estab., Felixstowe, 2.6.31. F. Tedman, M.B.E., to No. 4 Stores Depot, Ruislip, 1.6.31. A. W. Turner, D.C.M., to Air Ministry (D. of E.), 8.6.31.

Flight-Lieutenant F. D. D. Gaussen, to H.Q., R.A.F., Middle East, Cairo, 16.5.31.

Flying Officer E. N. Lowe, to No. 1 School of Tech. Training (Apprentices), Halton, 29.5.31.

Accountant Branch

Wing Commander C. P. Ogden, O.B.E., to R.A.F. Depot, Uxbridge, for accountant duties, 4.5.31.

Pilot Officers : The undermentioned are all posted to H.Q., R.A.F., Cranwell, on appointment to permanent commns. with effect from 1.6.31 :—W. M. Lyons, F. C. Hayward, C. G. Stowell, T. E. Horsfield, L. Hornabrook, E. Bowman.

Medical Branch

Flight-Lieutenants : L. P. McCullagh, to No. 1 School of Tech. Training (Apprentices), Halton, 18.6.31. M. Pearson, to Station H.Q., Duxford, 15.6.31.

Flying Officer E. K. Pritchard, to R.A.F. Depot, Uxbridge, on appointment to a temporary commn., 14.5.31.

NAVAL APPOINTMENTS

THE following appointments have been made by the Admiralty :—

LIEUTENANT (F/O., R.A.F.) C. W. Byas, to *Victory*, for R.A.F. Base, Gosport (July 1).

PROMOTIONS

LIEUTENANTS : D. M. L. Neame (F/O., R.A.F.), A. M. Kimmins (Flight-Lieut., R.A.F.), J. W. M. Healing (F/O., R.A.F.), to rank of Lieut.-Commander (seny. June 15).

◈ ◈

The Royal Air Force Memorial Fund.

THE second meeting of the Executive Committee of the Fund for the current year was held at Iddesleigh House, on May 6. Sir Charles McLeod, Bart., chairman and honorary treasurer, was in the Chair, and there was a very full attendance of members of the Committee, including the deputy chairman, Dame Helen Gwynne-Vaughan, G.B.E.

The usual financial statements were presented to the Committee, and in this connection it was noted that grants for relief of distress for the four months from January 1 to April 30, 1931, totalled a sum of £5,302, representing a considerable increase on former grants in aid.

The Committee welcomed a new member in Air Commodore B. C. H. Drew, C.M.G.

It was reported that the Vanbrugh Castle School, Blackheath, S.E.3, supported by the Fund, had reopened for the summer term on April 21, with a full attendance of 39 boys, and there is a long waiting list for admission to the school.

It was reported that the Grants Sub-Committee between March 11 and the date of the meeting had dealt with 50 cases at their meetings, and that, in addition, the secretary, with his limited powers, within the same period had dealt with 105 cases of appeals for help.

It was reported to the Committee that the Annual Report for 1930 to the number of 1,550 copies, had been distributed to everyone concerned, including all the units of the R.A.F. between April 1 and 14.

It was also reported to the meeting that the recently appointed High Commissioner for the Dominion of Canada, the Hon. Howard Ferguson, had accepted office as one of the Vice-Presidents of the Fund.

The next meeting of the Executive Committee was fixed for Wednesday, July 1, 1931, at the offices of the Fund at 3 p.m.

The usual meeting of the Grants Sub-Committee of the Fund was held at Iddesleigh House on May 14. Mr. W. S. Field was in the chair, and the other members of the committee present were : Mrs. L. M. K. Pratt Barlow, O.B.E. ; Air Commodore B. C. H. Drew, C.M.G. The committee considered in all 23 cases and made grants to the amount of £324 13*s.* 6*d.*

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Attachment of Foreign Officers to the Royal Air Force

WITH reference to previous notices regarding the statement of Lieut.-Comdr. Sax and Lieut. Pesatchich, of the Yugo-Slav Air Service, to the Royal Air Force, Lieut.-Comdr. Sax proceeded to Donibristle and Lieut. Pesatchich to Andover on May 11. Lieut.-Comdr. Sax will study the organisation of, and the work carried out by No. 100 (Bomber) Squadron, and Lieut. Pesatchich that of No. 12 and No. 101 (Bomber) Squadrons. The two officers remained at these stations until June 14.

Gliding by R.A.F. Personnel

THE question of gliding by R.A.F. personnel has been under consideration, and it has been decided that, while there is no objection to the formation of gliding clubs at air force stations or to the participation of officers and airmen in this form of recreation, gliding will not be recognised either as Air Force duty or as an "organised game" within the meaning of K.R. and A.C.I. It will, on the contrary, be treated as a purely private activity comparable with the flying of civil aeroplanes, and will be subject to the same general restrictions (save where these are plainly inapplicable) as are imposed on civil flying. Officers and airmen participating in this sport are advised to cover by insurance all the risks.

Award of Honours and Decorations

The following is an extract from a notice which appeared in the *London Gazette*, dated March 27, 1931 :—

"The King has been graciously pleased to approve of the Award of the Medal of the Military Division of the Most Excellent Order of the British Empire to the undermentioned :—

For Gallantry

362370 Leading Aircraftman Robert Ewing Douglas, Royal Air Force, for conspicuous gallantry displayed in an attempt to save the lives of two fellow airmen at Kohat, India, on June 13, 1930."

New Director of Works and Buildings, Air Ministry

THE Air Ministry announces :—The Secretary of State for Air has appointed Colonel J. F. Turner, D.S.O., to be Director of Works and Buildings with effect from July 7 next, in succession to Brigadier-General H. Biddulph, C.B., C.M.G., D.S.O.

THE INDUSTRY

Recent K.L.G. Successes

PILOT OFFICER J. GRIERSON, who recently flew from Karachi to Lympne in four days, has sent the following telegram to K.L.G. Plugs, Ltd., of Putney Vale:—"Your plugs used in Rouge-et Noir Flight Karachi Lympne in four days ten and half hours, flying time fifty-two hours, no cleaning or change made throughout, condition at end perfect although shade temperature on journey up to 115 deg., very satisfied this outstanding performance.—Grierson."

Another message comes from Capt. Kennard, winner of the Heston-Newcastle air race, stating:—"Again your reputation has been upheld. I won the "Evening World Trophy" race in my Klemm Cirrus III fitted with K.L.G. plugs. Not a single miss, a good hot spark, and the rest brought me through. I thank you." Capt. E. W. Percival, who was second, and put up the fastest time of 145 m.p.h., also "enthused" about his K.L.G. plugs.

"B. & L." and "B. & S."

WE are informed by Best & Lloyd, Ltd., of Birmingham, that they have sold to Messrs. Benton & Stone, Ltd., of Bracebridge Street, Birmingham, that department of their business known as the Automatic Products Department, where for 20 years they have made components and accessories for the motor car, motor cycle, aircraft and general engineering trades.

Mr. Scott on his "Gipsy Moth"

THE De Havilland Aircraft Co., Ltd., have received a letter from Mr. C. W. A. Scott, in the course of which he writes:—

"It has been my good fortune to complete a task that I had set myself, but you will understand that I first of all provided myself with the best tools for the work. In my cable to you from Port Darwin on arrival in Australia, I wired that 'Gipsy Moth fully justified my expectations.' This was so, for I selected your machine after first proving its worth. I should have been most surprised if I had been let down by the Gipsy I used. In point of fact I did not expect the performance that I got under load carried, and at no time was I in doubt of the issue or at any time labouring under any concern for my machine."

"Luxor" Goggles and the Schneider Trophy

THE Air Ministry has awarded the contract for goggles for the Schneider Trophy Team to Messrs. E. B. Meyrowitz, Ltd., for the third consecutive time. The model which will be used this year is the Luxor No. 6, with hand-ground Acetex Safety Glass lenses and the large flat cushions. The members of the team will be supplied also with Crookes B. tinted lenses, which they will use to overcome excessive glare which they are apt to encounter, especially during the training period.

Two Useful Products

READERS of FLIGHT will be well aware of the value of the "Chemico" Non-flam paint remover called "Nameloff," but it is quite possible that two of the latest products from this firm have not yet come to their notice. Both of these should be equally useful for aircraft, as for motor cars and other engines. The first is "Chemico" Penetrating Lubricant. This is very high grade lubricant, specially prepared, which penetrates where ordinary oil cannot get, such as between the leaves of springs or in any joints or nuts which are rusted up. These latter can soon be released with a few drops of this lubricant. The second is "Chemico" Flushing Oil, which is infinitely preferable to paraffin for removing traces of petrol-diluted oil, sludge, etc., from the crankcase. It can be used afterwards for cleaning engine parts, etc., and is also a perfect upper cylinder lubricant. Any of these products can be obtained from The County Chemical Co., Ltd., Chemico Works, Birmingham.

Parachuting at Hull

IN connection with our paragraph last week about the Hull Air Pageant, we have been asked to correct the statement that Capt. McKenzie made the parachute drop. Capt. McKenzie piloted the machine, but the parachute jump was made by Capt. E. W. Stewart. At the same time, we have been requested to state that there is no truth in the rumour (not published in FLIGHT) that Capt. Stewart has broken his ankle. He is, in fact, in the best of condition, and club secretaries and others interested in parachute descents should communicate direct with Capt. Stewart, at Redcot, St. James's Avenue, Hampton Hill, Middlesex. Capt. Stewart's telephone number is: Molesey 1105.

IMPORTS AND EXPORTS

AEROPLANES, airships, balloons and parts thereof (not shown separately before 1910).

For 1910 and 1911 figures see FLIGHT for January 25, 1912.
For 1912 and 1913, see FLIGHT for January 17, 1914.
For 1914, see FLIGHT for January 15, 1915, and so on yearly, the figures for 1930 being given in FLIGHT, January 16, 1931.

	Imports.		Exports.		Re-exports.	
	1930.	1931.	1930.	1931.	1930.	1931.
	£	£	£	£	£	£
Jan.	...2,987	7,965	147,935	142,596	—	1,074
Feb.	...2,460	3,303	226,049	110,587	1,000	1,293
Mar.	... 744	5,615	156,098	83,088	802	3,441
April	...2,959	2,216	213,390	213,401	79	530
May	11,706	1,964	158,460	275,382	2,550	198
	20,856	21,063	901,932	825,054	4,431	6,536

PUBLICATIONS RECEIVED

Aluminium Broadcast. Vol. III, No. 9. The British Aluminium Co., Ltd., Adelaide House, King William Street, London, E.C.4.

Aeronautical Research Committee Reports and Memoranda: No. 1363 (Ae.491—T.2977 amd. "a"). Maximum Lift in Closed and Open Jet Tunnels. By F. B. Bradfield, K. W. Clark and R. A. Fairthorne. December, 1930. Price, 1s. net. *No. 1278 (Ae.424—T.2823). Spinning Experiments on a Single-Seater Fighter. Part I, Further Model Experiments.* By A. S. Batson and H. B. Irving. *Part II, Full-Scale Spinning Tests.* By S. B. Gates. August, 1929. Price 9d. net. *No. 1353 (Ae.484—T.2984). The Two-Dimensional Flow of Air Around an Aerofoil of Symmetrical Section.* By T. Tanner. July, 1930. Price, 1s. net. *No. 1356 (Ae.487—T.2969). Spinning of a Model of the Fairey III F. Seaplane.* By H. B. Irving and A. S. Batson. June, 1930. Price, 1s. net. H.M. Stationery Office, Kingsway, London, W.C.2.

Air Navigation for the Private Owner. By F. A. Swoffer. London: Sir Isaac Pitman & Sons, Ltd. Price, 7s. 6d. net.

The Aeroplane Simply Explained. By E. A. McGuinness. London: Sir Isaac Pitman & Sons, Ltd. Price, 2s. 6d. net.

AERONAUTICAL PATENT SPECIFICATIONS

Abbreviations: Cyl. = cylinder; i.c. = internal combustion; m. = motors. The numbers in brackets are those under which the Specification will be printed and abridged, etc.)

APPLIED FOR IN 1930

Published June 18, 1931

5,378. H. SONABEND. Overall garments for aviators' use. (349,095.)
5,478. W. E. HEWISON. Navigating instruments. (349,026.)
6,867. C. H. BICHLER. Silencing-device for exhaust of i.c. engines for aircraft. (349,147.)
7,064. D. NAPIER AND SON, LTD. and R. H. HUTCHINSON. Cyls. of i.c. engines. (349,154.)
9,745. SIR F. H. ROYCE. Control means of i.c. engines for aircraft. (349,209.)
9,974. SCHNEIDER ET CIE. Mountings for anti-aircraft guns. (349,211.)
17,206. GOODYEAR-ZEPPELIN CORPN. Power-transmission units. (349,323.)
20,921. E. BUGATTI. Mounting of flywheel on shafts of multi-cyl. engines. (340,353.)
21,943. BAYERISCHE FLUGZEUGWERKE AKT.-GES., and MESSERSCHMITT, W. Aircraft. (349,365.)

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